DATE: 4/14/2010

INVITATION TO BID
THIS IS NOT AN ORDER

BID NO.: 50-00097323

JEFFERSON PARISH

PURCHASING DEPARTMENT
P.O. BOX 9
GRETNA, LA. 70054-0009
504-364-2678

VENDOR:

BUYER: D. Nelson

BIDS WILL BE RECEIVED IN THE PURCHASING DEPARTMENT, SUITE 4400, JEFFERSON PARISH GENERAL GOVERNMENT BUILDING, 200 DERBIGNY STREET, GRETNA, LA 70053 UNTIL 2:00 PM, 5/11/2010 AND PUBLICLY OPENED UPON COMPLETION OF ADMINISTRATIVE TASKS.

LATE BIDS WILL NOT BE ACCEPTED

NOTE: ONLY BIDS WRITTEN IN INK OR TYPEWRITTEN, AND PROPERLY SIGNED BY A MEMBER OF THE FIRM OR AUTHORIZED REPRESENTATIVE, WILL BE ACCEPTED. PENCIL AND/OR PHOTOSTATIC FIGURES OR SIGNATURES DISQUALIFY BID.

INSTRUCTIONS FOR BIDDERS AND GENERAL CONDITIONS

THE FOLLOWING INSTRUCTIONS APPLY TO ALL BIDS

All bids submitted are subject to these instructions and general conditions and any special conditions and specifications contained herein, all of which are made part of this bid proposal reference. All quotations shall be based on F.O.B. Agency warehouse or job site, anywhere within the Parish as designated by the Purchasing Department. The provisions do not apply to public works projects

Questions on this bid are to be faxed to (504) 364-2693 no later than FIVE (5) working days prior to bid opening. Bid numbers should be mentioned in all requests.

The purpose and intention of this invitation to bid is to afford all suppliers an equal opportunity to bid on all construction, maintenance, repair, operating supplies and/or equipment listed in this bid proposal. JEFFERSON PARISH WILL ACCEPT ONE BID ONLY FROM EACH VENDOR. Items bid must meet or exceed specifications.

JEFFERSON PARISH will accept one price for each item unless otherwise indicated. Two or more prices for one item will result in bid rejection.

If the bid exceeds $20,000.00 and if someone other than a corporate officer signs for the Bidder/Contractor, a copy of a corporate resolution or other signature authorization shall be required for submission of bid. Failure to include a copy of the appropriate signature authorization, if required, may result in the rejection of the bid unless bidder has complied with LSA-R.S. 38:2212(A)(1)(c) or LSA-R.S. 38:2212 (O).

A. AWARD OF CONTRACT: JEFFERSON PARISH reserves the right to award contracts or place orders on a lump sum or individual item basis, or such combination, as shall in its judgment be in the best interest of JEFFERSON PARISH. Every contract or order shall be awarded to the LOWEST RESPONSIBLE BIDDER, taking into consideration the CONFORMITY WITH THE SPECIFICATIONS and the DELIVERY AND/OR COMPLETION DATE.

Preference is hereby given to materials, supplies, and provisions produced, manufactured or grown in Louisiana, quality being equal to articles offered by competitor soutside the state. "LSA-R.S.38:2251-2261"

B. USE OF BRAND NAMES AND STOCK NUMBERS: Where brand names and stock numbers are specified, it is for the purpose of establishing certain minimum standards of quality. Bids may be submitted for products of equal quality, provided brand names and stock numbers are specified. Complete product data may be required prior to award.

C. CANCELLATION OF CONTRACT: JEFFERSON PARISH reserves the right to cancel all or any part if not shipped promptly. No charges will be allowed for parking or cartage unless specified in quotation. The order must not be filled at a higher price than quoted. JEFFERSON PARISH reserves the right to cancel any contract at anytime and for any reason by issuing a THIRTY (30) day written notice to the contractor.

For good cause and as consideration for executing a contract with Jefferson Parish, vendor conveys, sells, assigns and transfers to Jefferson Parish or its assigns all rights, title and interest in and to all causes of action it may now or hereafter acquire under the antitrust laws of the United States and the State of Louisiana, relating to the particular good or services purchased or acquired by Jefferson Parish.

INSTRUCTIONS FOR BIDDERS AND GENERAL CONDITIONS

D. PRICES: Jefferson Parish is exempt from paying sales tax under LSA-R.S. 47:301 (8)(c). All prices for purchases by Jefferson Parish of supplies and materials shall be quoted in the unit measure specified and unless otherwise specified, shall be exclusive of state and Parish taxes.

Quantities listed are for bidding purposes only. Actual requirements may be more or less than quantities listed.

Bidders are not to exclude from participation in, deny the benefits of, or subject to discrimination under any program or activity, any person in the United States on the grounds of race, color, national origin, or sex; nor discriminate on the basis of age under the Age Discrimination Act of 1975, or with respect to an otherwise qualified handicapped individual as provided in Section 504 of the Rehabilitation Act of 1973, or on the basis of religion, except that any exemption from such prohibition against discrimination on the basis of religion as provided in the Civil Rights Act of 1964, or Title VI and VII of the Act of April 11, 1968, shall also apply. This assurance includes compliance with the administrative requirements of the Revenue Sharing final handicapped discrimination provisions contained in Section 51.55 (c), (d), (e), and (k)(5) of the Regulations. New construction or renovation projects must comply with Section 504 of the 1973 Rehabilitation Act, as amended, in accordance with the American National Standard Institute's specifications (ANSI A117.1-1961).

E. RESPONSE TO INVITATION: If your company is unable to bid on this request, please state your reason on bid form, and return to this office before bid opening date. Failure to do so may result in the removal of your company from Jefferson Parish's vendors list.

F. POSTING OF BIDS: Non-Advertised bids will be posted on bulletin board in Suite 4400, Jefferson Parish General Government Building, Gretna, LA, for a period of Five (5) working days after opening date.

Advertised bids will be tabulated and a copy forwarded to each responsive bidder.

IN ACCORDANCE WITH RECENT STATE LEGISLATION JEFFERSON PARISH IS NOW OFFERING ELECTRONIC PROCUREMENT TO ALL VENDORS

JEFFPro is the current Electronic Procurement System being used by the Parish. This system allows vendors the convenience of entering and submitting their pricing online. This is a secure site and no one has access to bid information.

Please follow the Purchasing Department link at purchasing.jeffparish.net to register and review Jefferson Parish solicitations.

The general specifications for construction projects and the purchase of materials, services and/or supplies are those adopted by the JEFFERSON PARISH Council by Resolution No. 113646 or 113647 dated 12/09/09. The general conditions adopted by this resolution shall be considered as much a part of this document as if they were written wholly herein. A copy may be obtained from the Office of the Parish Clerk, Suite 6700, Jefferson Parish General Government Building, 200 Derbigny Street, Gretna, LA 70053.

ADDITIONAL REQUIREMENTS FOR THIS BID

PLEASE MATCH THE NUMBERS PRINTED IN THIS BOX WITH THE CORRESPONDING INSTRUCTIONS BELOW.

12,13,14

1. All bidders are invited to attend the pre-bid conference. Failure to attend the pre-bid conference shall not relieve the bidder of responsibility for information discussed at the conference. This conference is held to allow questions to be answered and inspect the site with owner's representative, etc. Failure to attend the pre-bid conference and inspection does not relieve the successful bidder from the necessity of furnishing materials or performing any work that may be required to complete the work in accordance with the specification (with no additional cost to the owner).

INSTRUCTIONS FOR BIDDERS AND GENERAL CONDITIONS

2. Contractor must hold current applicable JEFFERSON PARISH licenses with the Department of Inspection and Code Enforcement. Contractor shall obtain any and all permits required by the JEFFERSON PARISH Department of Inspection and Code Enforcement. The contractor shall be responsible for the payment of these permits. All permits must be obtained prior to the start of the project.

3. A Louisiana State Contractor's License may be required in accordance with LSA-R.S. 37:2150 et seq. If providing information on the internet (JEFFPro) please enter license number in the vendor comment section of the bid form.

4. It is the bidder's responsibility to visit the job site and evaluate the job before submitting a bid.

5. Job site must be clean and free of all litter and debris daily and upon completion of the contract. Passageways must be kept clean and free of material, equipment, and debris at all times. Flammable material must be removed from the job site daily because storage will not be permitted on the premises. Precautions must be exercised at all times to safeguard the welfare of JEFFERSON PARISH and the general public.

6. All awards in excess of $5,000.00 for the construction, alteration, or repair of any public works will b reduced to a formal contract which shall be recorded at the contractor's expense. A price list of recordation costs may be obtained from the Clerk of Court and Ex-officio Recorder of Mortgages for the Parish of Jefferson. All awards in excess of $25,000.00 reduced to formal contract will require a performance bond.

7. A performance bond will be required for this bid. The amount of the bond will be 100% of the contract price unless otherwise indicated in the specifications. Performance bond shall be supplied at the signing of the contract.

8. Please indicate if you have insurance: YES _____ NO _____
Successful bidder will be required to furnish proof of insurance to this office.
Successful bidder will be required to furnish Federal I.D. Number.

9. Minimum insurance requirements for this bid are as indicated on the attached sheet.

10. Each bid must be accompanied by a cashier's check, certified check, money order, or surety bid bond in the amount of 5% of the bid, including all alternates.

11. Affidavit required is to be submitted within 10 working days of the bid opening to the Purchasing Department on all solicitations for construction, alteration or demolition of public building or project. (LSA-RS 38:2224)

12. This is a requirements contract to be provided on an as needed basis.

13. In the event that the successful bidder cannot furnish a specific item or material and labor in the required time, JEFFERSON PARISH may purchase on an emergency basis from the next lowest bidder, or available source, until such time as the successful bidder has notified the PARISH in writing that his stock or labor capability has been replenished. The difference in price will be charged against the successful bidder of this contract, and evidence of purchases and price will be provided.

14. Freight charges should be included in total cost when quoting. If not quoted FOB DELIVERED, freight must be quoted as a separate item. Bid may be disqualified if not quoted FOB DELIVERED or if freight charges are not indicated on bid form.

BID FORM

Non Public Works

All Public Work Projects are required to use the Louisiana Uniform Public Work Bid Form

DELIVERY: FOB JEFFERSON PARISH

INDICATE DELIVERY DATE ON EQUIPMENT AND SUPPLIES _____

LOUISIANA CONTRACTOR'S LICENSE NO.: (if applicable) _____

FIRM NAME:_____

ADDRESS::_____

CITY, STATE:_____ ZIP:_____

TELEPHONE:(____)_____ FAX:(____)_____

EMAIL ADDRESS: _____

All prices must be held firm unless an escalation provision is requested in this bid. Jefferson Parish will allow one escalation during the term of the contract, which may not exceed the U.S. Bureau of Labor Statistics National Index for all Urban Consumers, unadjusted 12 month figure. The most recently published figure issued at the time an adjustment is requested will be used. A request must be made in writing by the vendor, and the escalation will only be applied to purchases made after the request is made.

Are you requesting an escalation provision?

YES _____ NO _____

MAXIMUM ESCALATION PERCENTAGE REQUESTED _____%

INITIAL BID PRICES WILL REMAIN FIRM THROUGH THE DATE OF _____.

For the purposes of comparison of bids when an escalation provision is requested, Jefferson Parish will apply the maximum escalation percentage quoted by the bidder to the period to which it is applied in the bid. The initial price and the escalation will be used to calculate the total bid price. It will be assumed, for comparison of prices only, that an equal amount of material or labor is purchased each month throughout the entire contract.

TOTAL PRICE OF ALL BID ITEMS: $ _____

AUTHORIZED
SIGNATURE:_____

SIGNING INDICATES YOU HAVE READ AND COMPLY WITH THE INSTRUCTIONS AND CONDITIONS.

NOTE: All bids should be returned with the BID NUMBER and BID OPENING DATE indicated on the outside of the envelope submitted to the Purchasing Department.

INVITATION TO BID FROM JEFFERSON PARISH - continued

BID NO.: 50-00097323

SEALED BID

ITEM NUMBER	QUANTITY	U/M	DESCRIPTION OF ARTICLES	UNIT PRICE QUOTED	TOTALS
			TWO (2) YEAR CONTRACT FOR A SUPPLY OF REFLECTIVE SHEETING FOR JEFFERSON PARISH DEPARTMENT OF PUBLIC WORKS TRAFFIC ENGINEERING		
1	450	SQFT	0010 - Super-High Efficiency, Full Cube Prismatic Reflective Sheeting, Series 4000 (Diamond Grade - DG3) or approved equal, with Pressure Sensitive Adhesive. Colors Series White (4090), Red (4092) Green (4097), Blue (4095), Yellow (4091) See Specification Number TE-006-2010 and TE-006A-2010		
2	30000	SQFT	0020 - Super-High Efficiency, Full Cube Prismatic Reflective Sheeting Series 4000, (Diamond Grade - DG3) or approved equal, with Pressure Sensitive Adhesive. Colors Series Fluorescent all colors, Fluorescent Yellow - FY (4081), Fluorescent Yellow-Green - FYG (4083), Fluorescent Orange - FO (4084) and including Fluorescent Orange-FO (3924S) See Specification Number TE-006-2010 and TE-006A-2010		
3	750	SQFT	0030 - Super-High Efficiency, Full Cube Prismatic Striped Reflective Sheeting Series 4000 Diamond Grade - DG3 or approved equal with Pressure Sensitive Adhesive Colors Series Alternating Orange and White pre-striped barricade sheeting with 6 inch Left or Right stripes 446 OR 4 inch Left or Right stripes 444 See Specification TE-006-2010 and TE-006A-2010		
4	15000	SQFT	0040 - Super-High Efficiency, Full Cube Prismatic Flexible Reflective Sheeting, Series 4000, (Diamond Grade - DG3) Diamond Grade (Series 3910 3914) Flexible Reflective Sheeting or approved equal with Pressure Sensitive Adhesive for Reflectorizing Reboundable Plastic Substrate Work Zone Traffic Control Devices - 4 inch or 8 inch.		

INVITATION TO BID FROM JEFFERSON PARISH - continued

BID NO.: 50-00097323

SEALED BID

ITEM NUMBER	QUANTITY	U/M	DESCRIPTION OF ARTICLES	UNIT PRICE QUOTED	TOTALS
			Colors: White and Orange. SEE SPECIFICATION NO. TE-006-2010 AND TE-006A-2010		
5	5000	SQFT	0050 - High Intensity Prismatic Reflective Sheeting, Series 3930 (High Intensity Prismatic) or approved equal with Pressure Sensitive Adhesive. Colors Series White (3930), Red (3932) Green (3937), Blue (3935), Yellow (3931) Orange (3934). SEE SPECIFICATION NUMBER TE-007-2010		
6	500	SQFT	0060 - High Intensity Prismatic Striped Reflective Sheeting, Series 3930, (High Intensity Prismatic) or approved equal with Pressure Sensitive Adhesive. Colors Series Alternating Orange and White pre-striped barricade sheeting with 6 inch Left or Right stripes (336) or 4 inch Left or Right stripes (334). SEE SPECIFICATION NUMBER TE-007-2010		
7	5000	SQFT	0070 - High Intensity Prismatic Flexible Reflective Sheeting, Series 3930, (High Intensity Prismatic) or approved equal with Pressure Sensitive Adhesive for Reflectorizing Reboundable Plastic Substrate Work Zone Traffic Control Devices - 4 in. or 6 in. Colors White and Orange. SEE SPECIFICATION NO. TE-007-2010.		
8	5000	SQFT	0080 - Enclosed Lens Reflective Sheeting Series 3270 (Engineer Grade) or approved equal with Pressure Sensitive Adhesive. Colors Series White (3270), Red (3272) Green (3277), Blue (3275), Yellow (3271) Brown (3279). SEE SPECIFICATION NO. TE-008-2010.		
9	1000	SQFT	0090 - Cement and Adhesives for Traffic control Pigmented Plastic Films - Pressure		

INVITATION TO BID FROM JEFFERSON PARISH - continued

BID NO.: 50-00097323

SEALED BID

ITEM NUMBER	QUANTITY	U/M	DESCRIPTION OF ARTICLES	UNIT PRICE QUOTED	TOTALS
			Sensitive Adhesive Series 650 or approved equal with heat activated adhesive Colors White (650) Black (655) See Specification Number TE-009-2010		
10	1000	SQFT	0095 - Pigmented Plastic Film Series 650 or approved equal with Heat Activated Adhesive. Colors White (650), Black (655). ALL OF THE ABOVE PIGMENTED PLASTIC FILM TO MEET SPECIFICATION NO. TE-009-2010		
11	35000	SQFT	0100 - Electronic Cuttable Film (ElectroCut Film - E.C. Film) Series 1170, or approved equal with Pressure Sensitive Adhesive. Colors Series Clear (1170), Yellow (1171), Red (1172), Orange (1174) Blue (1175), Green (1177), Black (1178), Brown (1179) ALL OF THE ABOVE ELECTRONIC CUTTABLE FILM IS TO BE NON-PERFORATED FOR USE IN FRICTION FEED ELECTRONIC CUTTING DEVICES AND TO MEET SPECIFICATION Number TE-009A-2010		
12	750	SQFT	0110 - Clear Protective Overlay Film, Series 1150, or approved equal with Pressure Sensitive Adhesive.		
13	750	SQFT	0120 - Clear Premium Protective Overlay Film, Series 1160 or approved equal with Pressure Sensitive Adhesive. THE ABOVE CLEAR FILM WHEN APPLIED TO REFLECTIVE SHEETING ALLOWS REMOVAL OF GRAFFITI FROM SIGN SURFACES.		
14	10000	SQFT	0130 - Clear Transfer Tape, Series TPM-5, or approved equal (For use with ElectroCut Film Series 1170) THE ABOVE TRANSFER TAPE IS USED FOR PURPOSES OF PRESPACING AND TRANSFERRING ELECTRONIC CUTTABLE FILM.		

INVITATION TO BID FROM JEFFERSON PARISH - continued

BID NO.: 50-00097323

SEALED BID

ITEM NUMBER	QUANTITY	U/M	DESCRIPTION OF ARTICLES	UNIT PRICE QUOTED	TOTALS
15	50	ROLL	0140 - MARKERS, PLAQUES AND TRAFFIC CONTROL DEVICE A310-P WHITE 4 INCH TAPE 3M STAMARK PAVEMENT MARKING TAPE SERIES 310 SEE SPECIFICATION TE-010-2010		
16	50	ROLL	0150 - MARKERS, PLAQUES AND TRAFFIC CONTROL DEVICE A311-P YELLOW TAPE 4 INCHES 3M STAMARK PAVEMENT MARKING TAPE SERIES 310 SEE SPECIFICATION NUMBER TE-010-2010		
17	50	ROLL	0160 - MARKERS, PLAQUES AND TRAFFIC CONTROL DEVICE A310-P WHITE 8 INCH 3M STAMARK PAVEMENT MARKING TAPE SERIES 310 SEE SPECIFICATION NUMBER TE-010-2010		
18	10	PKG	0170 - Stripes and Legends, Plastic, Prefabricated SMS-L270ES-SA Straight Arrow 115.2 inches by 38.4 inches Pre-cut pavement marking symbols and legends made from 3M Stamark pavement Marking Tape L270 ES white with pressure sensitive adhesive and liner See specification number TE-013-2010		
19	10	PKG	0180 - Stripes and Legends, Plastic, Prefabricated Pre-cut pavement marking symbols and legends made from 3M Stamark Pavement marking Tape L270 ES white with pressure sensitive adhesive and liner SMS-L270ES-LA Left Curve Arrow		

INVITATION TO BID FROM JEFFERSON PARISH - continued

BID NO.: 50-00097323

SEALED BID

ITEM NUMBER	QUANTITY	U/M	DESCRIPTION OF ARTICLES	UNIT PRICE QUOTED	TOTALS
			96 inches by 73 inches See specification number TE-013-2010		
20	10	PKG	0190 - Stripes and Legends, Plastic, Prefabricated SMS-L270ES-RA Right Curve Arrow 96 inches by 73 inches Pre-cut pavement marking symbols and legends made from 3M Stamark Pavement Marking Tape L270 ES white with pressure sensitive adhesive and liner See specification number TE-013-2010		
21	20	PKG	0200 - Stripes and Legends, Plastic, Prefabricated SMS-L270ES-ON Only Legend 8 feet 96 inches high Pre-cut pavement markings symbols and legends made from 3M Stamark Pavement MArking tape L270 ES white with pressure sensitive adhesive and liner See specification TE-013-2010		
22	20	PKG	0210 - Stripes and Legends, Plastic, Prefabricated SMS-L270ES-SC School Legend 8 feet 96 inches high Pre-cut pavement marking symbols and legends made from 3M Stamark Pavement Marking Tape L270 ES white with pressure sensitive adhesive and liner See specification number TE-013-2010		
23	25	ROLL	0220 - Stripes and Legends, Plastic, Prefabricated 24 inches		

INVITATION TO BID FROM JEFFERSON PARISH - continued

BID NO.: 50-00097323

SEALED BID

ITEM NUMBER	QUANTITY	U/M	DESCRIPTION OF ARTICLES	UNIT PRICE QUOTED	TOTALS
			Series A270 ES See Specification TE-013-2010		
24	50	ROLL	0230 - Stripes and Legends, Plastic, Prefabricated 12 inches Series A270 ES See Specification Number TE-013-2010		
25	25	ROLL	0240 - Stripes and Legends, Plastic, Prefabricated 8 inch Series A270 ES See specification number TE-013-2010		
26	25	ROLL	0250 - Stripes and Legends, Plastic, Prefabricated 24 inch Series 380I-5ES High performance Contrast Marking Tape See Specification Number TE-012-2010		
27	25	ROLL	0260 - Stripes and Legends, Plastic, Prefabricated 12 inch Series 380I-5ES High Performance Contrast Marking Tape See Specification Number TE-012-2010		
28	12	EA	0270 - Transparent Process Colors Series 880I or approved equal for use with Full Cube Prismatic and High Intensity Prismatic Reflective Sheeting Note All colors information stay the same as noted on the original contract		

INVITATION TO BID FROM JEFFERSON PARISH - continued

BID NO.: 50-00097323

SEALED BID

ITEM NUMBER	QUANTITY	U/M	DESCRIPTION OF ARTICLES	UNIT PRICE QUOTED	TOTALS
			document		
29	16	EA	0280 - Transparent Process Colors, Series 700 or approved equal for use with Enclosed Lens Reflective Sheeting.		

Note All colors information stay the same as noted on the original contract document

ALL TRANSPARENT PROCESS COLORS TO BE COMPATIBLE WITH THE SPECIFIED SHEETINGS FOR THE PURPOSE OF MAINTAINING ALL

APPLICABLE MANUFACTURER'S WARRANTIES.

ALL OF THE ABOVE PROCESS COLORS AND THINNERS TO BE FURNISHED FREE BY MANUFACTURER

NOTE
SCW-82 AND SCW-568 SLIP SHEETING SHALL BE FURNISHED IN DIMENSIONS (STANDARD ROLL SIZE) AND QUANTITIES REQUIRED TO FABRICATE SIGNS FROM MATERIALS ORDERED UPON REQUEST AT NO COST
QUANTITIES FOR ALL ITEMS LISTED ARE ON A MORE OR LESS BASIS

BIDDER SHALL SUPPLY A SQUARE FOOT PRICE FOR EACH OF THE ABOVE LISTED SHEETING AND FILM TYPES WHICH WILL ALLOW JEFFERSON PARISH TO PURCHASE ANY STANDARD DIMENSION ROLL WITH THIS CONTRACT UPON REQUEST

Inks shall be provided at NO CHARGE when used with same manufacturer's Sheetings High Intensity and Engineer Grade.

SPECIFICATION NO. TE-006 – 2010
Revised 2/25/10
SPECIFICATION FOR
SUPER-HIGH EFFICIENCY, FULL CUBE REFLECTIVE SHEETING
(DIAMOND GRADE) FOR TRAFFIC SIGNS
TRAFFIC ENGINEERING DIVISION

Note: The following Specification (TE 006) contains both warranty and pre-Qualification clauses directly related to product performance. See Sections 4, 6, and 9.

1.0 Scope. This specification covers flexible, white or colored, Super-High Efficiency retro-reflective sheeting, tape and related processing materials designed to enhance the day/night visibility of traffic control signs and objects.

2.0 Applicable Documents. The following documents, of the issue in effect on the date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

2.1 ASTM Standards.

1.2.1. ASTM D 4956 Standard Specification for Retro-reflective Sheeting for Traffic Control

2.1.2. D 523 Standard Method for Test for Specular Gloss.

2.1.3. E 284 Standard Definition of Terms Relating to Appearance of Materials.

2.1.4. E 308 Computing the Colors of Objects by Using the CIE System.

2.1.5. E 810 Standard Test Method for Coefficient of Retroreflection of retroreflective Sheeting.

2.1.6. E 1164 Standard Practice for Obtaining Spectrophotometric Data for Object-Color Evaluation.

2.1.1. B209 Specification for Aluminum and Aluminum Alloy Sheet and Plate.

3.0 Description. The retroreflective sheeting shall have a smooth surface and shall be pre-coated with a pressure sensitive adhesive backing protected by a removable liner.

4.0 Test Methods.

4.1 Test Conditions. Unless otherwise specified herein, all applied and unapplied test samples and specimens shall be conditioned at the standard conditions of 73 +/- 3 degrees F (23 +/- 3 degrees C) and 50 +/- 5% humidity for 24 hours prior to testing.

4.2 Test Panels. Unless otherwise specified herein, when tests are to be performed using test panels, the specimens of retroreflective material shall be applied to smooth aluminum cut from ASTM B-209 Alloy 5052-H36, 5052-H38, 5154-H38 or 6061-T6 sheets in 0.020 inch (0.051 cm), 0.040 (0.102 cm) or 0.063 (0.160 cm) thickness. The aluminum shall be degreased and lightly acid etched before the specimens are applied. The specimens shall be applied to the panels in accordance with the recommendations of the retroreflective sheeting manufacturer.

4.3 Test Deck Performance. The manufacturer supplying materials specified herein must have supplied samples of these materials in each color for mounting on panels of the test deck located at the Jefferson Parish Sign and Signal Shop, 2100 Dickory Avenue. Harahan, LA. These materials must be mounted and exposed to continuous weather conditions for three years prior to bid opening. It is the responsibility of the manufacturer to insure that mounting has been accomplished. Successful performance of the product bid must be demonstrated continuously for a minimum of four years on this deck or actual field performance in Jefferson Parish in order for the product to be qualified as meeting these specifications. In lieu of three or four years test deck exposure, materials (sheeting, process colors, overlay films) shall be approved for use, when, in the opinion of this agency, sufficient evidence and certification from the manufacturer exists to ensure that the materials and services offered can reliably conform to this specification.

Successful performance shall include, but not be limited to continuous adhesion and lamination, shrinkage or distortion, retained color, chromatic quality and reflectivity. Failure to comply with this section of these specifications shall require disqualification and rejection of the manufacturer's product for the bid. See Section 5.8.

5.0. Physical Requirements

5.1 Color Requirements

Color shall be as specified and shall conform to the requirements of ASTM D 4956-05, Table 17. Luminance factors shall conform to ASTM D 4956-05, Tables 10 and 14.

5.2 Coefficient of Retroreflection, RA. The coefficients of Retroreflection shall not be less than the minimum values specified in Table I. Three 8 in x 8 in samples spaced evenly across and down a representative piece of sheeting shall be taken. The coefficient of retroreflection shall be determined for each of the three samples per ASTM E810. The average of the three values shall comply with the stated minimum table value and no single sample shall be less than 80% of the table value.

5.2.1. Units. Coefficients of retroreflection RA shall be specified in units of candelas per footcandle per square foot (candelas per lux per square meter).

5.2.2. The observation angles shall be 0.2, 0.5 and 1.0 degrees.

Values at O and 90 degrees orientation shall be averaged.

For screen printed transparent colored areas or transparent colored overlay films on white sheeting, the coefficients of retroreflection shall not be less than 70% of the values for corresponding color in Table I.

TABLE I

Minimum Coefficent of Retroreflection R_A
(Candelas per lux per square meter)

Table I
Minimum Coefficient of Retroreflection
(cd/lux/m^2)

White	-4	30
0.2	570	215
0.5	400	150
1.0	120	45

Blue	-4	30
0.2	26	10
0.5	18	6.8
1.0	5.4	2.0

Yellow	-4	30
0.2	425	160
0.5	300	112
1.0	90	34

FYG	-4	30
0.2	455	170
0.5	320	120
1.0	96	36

Red	-4	30
0.2	114	43
0.5	80	30
1.0	24	9

FY	-4	30
0.2	340	130
0.5	240	90
1.0	72	27

Green	-4	30
0.2	57	21
0.5	40	15
1.0	12	4.5

FO	-4	30
0.2	200	75
0.5	140	52
1.0	42	16

5.3. Gloss Retention. The retroreflective sheeting shall have an 85 degree specular glass of not less than 50 when tested in accordance with ASTM D-523.

5.4. Color Processing. The retroreflective sheeting shall permit cutting and color processing with compatible transparent and opaque process colors in accordance with the sheeting manufacturer's recommendations at temperatures of 60 to 100 degrees F (16 to 38 degrees C) and relative humidity's of 20% to 80%. The sheeting shall be heat resistant and permit force curing without staining of applied or unapplied sheeting at temperatures recommended by the sheeting manufacturer.

5.5. Adhesive. The protective liner attached to the adhesive shall be removed by peeling without soaking in water or other solutions, without breaking, tearing, or removing any adhesive from the backing. The protective liner shall be easily removed following accelerated storage for 4 hours at 160 degrees F (71 degrees C) under a weight of 2.5 pounds per square inch (0.176 Kg/cm2). The adhesive backing of the retroreflective sheeting shall produce a bond to support a 1.75 pound (0.79 Kg) weight for 5 minutes without the bond peeling for a distance of more than 2 inches (5.08 cm) when applied to a test panel prepared as in 4.2. Apply 4 inches (10.26 cm) of 1" x 6" (2.54 cm x 15.2 cm) specimen to a test panel. Condition and then position the panel face down horizontally, suspend the weight from the free end of the sample and allow it to hand free at an angle of 90 degrees to the panel surface for 5 minutes.

5.6. Impact Resistance. The retroreflective sheeting shall comply with the impact resistance requirements contained in ASTM D 4956-05, section 6.10.

5.7. Resistance to Accelerated Outdoor Weathering. The Retro-reflective surface of the sheeting shall be weather resistant and show no appreciable cracking, blistering, crazing, or dimensional change after 3 years unprotected outdoor exposure, facing the equator and inclined 45 degrees from the vertical. Following weather exposure, panels shall be washed in a 1% mild detergent solution for 45 seconds, rinsed thoroughly with clean water, blotted with a soft clean cloth and brought to equilibrium at standard conditions. After cleaning, the coefficient of retroreflection shall not be less than 80% of the values in Table I and the colors shall conform to the requirements of ASTM D 4956, table 17. The sample shall:

5.7.1. Show no appreciable evidence of cracking, scaling, pitting, blistering, edge lifting or curling or more than 1/32 inch (0.08 cm) shrinkage or expansion.

5.7.2. Be measured only at angles of 0.2 degrees observation and -4 degree entrance. Where more than one panel of a color is measured, the coefficient of retroreflection shall be the average of all determinations.

5.8 Resistance to Heat. The retroreflective sheeting, applied to a test panel and conditioned as in 4.1, shall be measured at 0.2 degree observations and –4 degree entrance angles and exposed to 160 +/- 5 degrees F (71 +/- 3 degrees C) for 24 hours in an air circulating oven. After heat exposure and conditioning according to provision of Section 4.1. The coefficients of retroreflection measured after exposure shall be between 85% and 115% of the values measured before exposure.

5.9. General Characteristics and Packaging. The retroreflective sheeting as supplied shall be of good appearance, free from ragged edges, cracks and extraneous materials, and shall be furnished in either rolls or sheets. When furnished in continuous rolls, the average number of splices shall not be more than 3 per 50 yards (45.7 m) of material with a maximum of 4 pieces in any 50 yard (45.7 m) length. Splices shall be butted or overlapped and shall be suitable for continuous application as furnished. When furnished as cut sheets or sign faces, the sheeting shall be packaged flat in accordance with commercially accepted standards. The sheeting shall be packed snugly in corrugated fiberboard cartons, in accordance with commercially accepted standards. Each carton shall clearly stipulate the brand, quantity, size, lot or run number and color. Stored under normal conditions the retroreflective sheeting as furnished shall be suitable for use for a minimum period of one year. Rolls and sheets are determined by requisition.

6.0 Performance Requirements and Obligations.

6.1. Certification. The sheeting manufacturer shall, upon request, submit With each lot or shipment, a certification which states that the material supplied will meet all of the requirements listed herein.

6.2. Field Performance Requirements.

6.2.1 For Permanent Signing – Warranty Ordinary Colors:

Sheeting manufactured of standard colors and processed and applied to sign blank materials in accordance with sheeting manufacturer's recommendations, shall perform effectively for at least 12 years. The retroreflective sheeting will be considered unsatisfactory if it has deteriorated due to natural causes to the extent that: (1) the sign is ineffective for its intended purpose when viewed from a moving vehicle under normal day and night driving conditions; or (2) the coefficient of retroreflection is less than the minimum specified for that sheeting during that period listed.

80% of values listed in Table I up to 7 years and
70% of values listed in Table I up to 12 years

Failure of process colors or overlay films provided and/or sold for use on recommended sheeting shall constitute a failure of entire sign and shall be replaced under manufacturer's replacement obligations.

For screen printed transparent colored areas or transparent colored overlay films on white sheeting, the coefficients of retroreflection shall not be less than 70% of the values for the corresponding integral color.

All measurements shall be made after sign cleaning according to sheeting manufacturer's recommendations.

6.2.2 For Permanent Signing – Warranty Fluorescent Colors:

Sheeting manufactured of fluorescent colors and processed and applied to sign blank materials in accordance with sheeting manufacturer's recommendations shall perform effectively for the number of years stated in this specification. The retroreflective sheeting will be considered unsatisfactory if it has deteriorated due to natural causes to the extent that: (1) the sign is ineffective for its intended purpose when viewed from a moving vehicle under normal day and night driving conditions; or (2) the coefficient of retroreflection is less than the minimum specified for that sheeting during that period listed.

80% of values listed in Table I up to 5 years and
70% of values listed in Table I up to 7 years

Failure of process colors or overlay films provided and/or sold for use on recommended sheeting shall constitute a failure of entire sign and shall be replaced under manufacturer's replacement obligations.

All measurements shall be made after sign cleaning according to sheeting manufacturer's recommendations.

6.2.3 For Temporary Signing – Warranty Fluorescent Orange Colors

Sheeting manufactured of fluorescent orange and applied to sign blank material in accordance with the sheeting manufacturer's recommendations, is expected to perform effectively for a minimum of three years. The retroreflective sheeting will be considered unsatisfactory if it has deteriorated due to natural causes to the extent that: (1) the sign is ineffective for its intended purpose or (2) retains less than 50% of the coefficient of retroreflection values listed in Table I at 0.2 degrees observation, -4 degrees entrance (measured in accordance with ASTM E810).

All measurements shall be made after sign cleaning according to the sheeting manufacturer's recommendations.

Natural causes include effects of exposure to weather. Natural causes exclude (without limitation) damage from exposure to chemicals, abrasion and other mechanical damage (such as from fasteners used to mount the sign, collisions or mishandling), vandalism, or malicious mischief.

7.0 Sheeting Manufacturer's Replacement Obligation

7.1 For standard colors where it can be shown that retroreflective signs, supplied and used according to the sheeting manufacturer's recommendations, have not met the performance requirements, the sheeting manufacturer shall cover restoration costs as follows for sheetings shown to be unsatisfactory during:

7.1.1 For the entire 12 years, the sheeting manufacturer will replace the sheeting required to restore the sign surface to its original effectiveness.

7.1.2 In addition, during the first seven years the sheeting manufacturer will cover the cost of restoration of the sign surface to its original effectiveness at no cost to agency for materials and labor.

7.1.3 Replacement sheeting shall carry the unexpired warranty of the sheeting it replaces.

7.2 For fluorescent colors where it can be shown that retroreflective signs, supplied and used according to the sheeting manufacturer's recommendations, have not met the performance requirements, the sheeting manufacturer shall cover restoration costs as follows for sheetings shown to be unsatisfactory:

7.2.1. If the failure occurs within the first 5 years from the date of fabrication, the manufacturer will, at is expense, restore the sign surface to its original effectiveness.

7.2.2. If the failure occurs with the 6^{th} or 7^{th} year from the date of fabrication, the manufacturer will furnish the necessary amount of sheeting necessary to restore the sign surface to its original effectiveness.

7.2.3. Replacement sheeting shall carry the unexpired warranty of the sheeting it replaces.

7.3 For temporary signing, fluorescent orange, where it can be shown that the retroreflective sheeting fails to conform to the performance requirements, the sheeting manufacturer's sole responsibility and purchaser's and user's exclusive remedy shall be:

7.3.1. Provide replacement sheeting. This sheeting shall carry the unexpired warranty of the sheeting it replaces.

7.4 Process Inks. The manufacturer of the sheeting shall manufacture and may offer at no additional cost or a nominal cost, the process inks, clears and thinners recommended for the sheeting to meet the performance requirements of this specification, and shall further be responsible for technical assistance in the use of these inks in accordance with Section 8.

7.5 Slip Sheet. Slip Sheet paper, if recommended by the sheeting manufacturer for sheeting surface protection or for use in packing, storage or shipping finished signs, may furnish in rolls by the manufacturer at no additional charge or nominal charge in at least equal square footage and in the same widths as the sheeting supplied.

7.6 Washers. Washers, if recommended by the sheeting manufacturer to protect the sign surface from damage by bolts or other fasteners, may be furnished by the manufacturer at no additional charge or a nominal charge.

8.0 Technical Assistance Requirements.

8.1 Instruction and Training.

8.1.1. The manufacturer supplying the sheeting requirements shall provide the services of a qualified technician for instruction and training at the primary sign manufacturing facility designated by the agency. This instruction shall be available on a quarterly basis at no additional cost, and shall include but not be limited to, training films, material application, equipment operation, silk screening techniques, packaging, storage and other proven sign shop practices as they apply to the reflective sheeting supplied by the manufacturer, and to assure that the resulting signs can comply with the applicable specifications.

8.1.2. Additional on-site technical assistance by the manufacturer supplying the retroreflective sheeting shall be provided at each of the sign shops designated in the bid invitation. This assistance will be provided at least once during each quarter of sign production, if required.

8.2 Compliance. Failure to comply with the requirements and schedules of 7.1 and 7.2 shall be cause for cancellation of annual contract if applicable.

9.0 Jefferson Parish requires sign dating of all signs at the time of application. That date constitutes the start of field performance obligation period.

10.0 Patented Devices, Materials and Processes. Seller will pay any damages, costs or fines resulting from any claims against Jefferson Parish for infringement or alleged infringement of third party patents by product

supplied by Seller under this specification. The costs paid by Seller shall include legal and court costs deemed reasonably necessary by counsel for Jefferson Parish in defending against such claims.

Specification For
Super-High Efficiency, Full Cube
Retroreflective Sheeting

TE-006A-2010

Specification for a Super-High Efficiency Full Cube Retroreflective Sheeting for Optimal Performance

---

NOTICE: This specification contains a sheeting manufacturer's field performance obligation paragraph 7.2 which shall apply only when included and made part of a bid request, proposal, and/or purchase agreement of **(Agency)**.

1.0 Scope

This specification covers flexible white or colored, Super-High Efficiency Full Cube Retroreflective Sheeting (hereinafter called sheeting), tape and related processing materials designed to enhance nighttime visibility of traffic control signs and objects. The sheeting shall consist of full cube prismatic lens elements with a distinctive interlocking diamond seal pattern visible from the face of a smooth surface. The sheeting shall have a precoated adhesive protected by an easily removable liner.

The sheeting shall be part of a family of matched component products required for the manufacture and imaging of traffic control signs as described in section 4. Only section 2.0, section 6.2.5, section 6.4, and section 7.2 cover printed colored areas of signs.

2.0 Prequalification

Materials (sheeting, process colors, overlay films) shall be considered for use only when, in the opinion of **(Agency)**, sufficient evidence exists to ensure that the materials and services offered can reliably conform to this specification.

3.0 Classification and Conformance

3.1 The sheeting shall conform to ASTM D 4956 as modified by this specification.

4.0 Items to be Included in Bids

4.1 Process Colors

4.1.1 The manufacturer of the sheeting shall manufacture and offer process colors in standard traffic colors, clears and thinners recommended for the sheeting to meet the performance requirements of this specification.

4.1.2 The process colors shall be a single line of traffic colors which may be applied before and after sheeting is applied to a substrate, require no component premixing, and will air dry for packing with proper ventilation in 3 hours or less and require no clear coating.

4.2 Overlay Films

The sheeting manufacturer shall also manufacture colored acrylic imaging films and clear protective overlays, which are compatible with the sheetings, and when used in accordance with the sheeting manufacturer's instructions, shall not lessen the warranty term as described in section 7.2.

5.0 Test Panels and Test Conditions

Unless otherwise specified herein, sheeting shall be applied to test panels in accordance with ASTM D 4956-09, section 7.2 and test conditions shall conform to ASTM D 4956-09 section 7.1.

6.0 Requirements

6.1 Color Requirements

6.1.1 Colors

Color shall be as specified and shall conform to the Daytime and Nighttime Color Specification Limits of ASTM D 4956. Daytime luminance factors shall conform to ASTM D 4956-09 Table 2.

6.1.1.1 Ordinary Colors

Conformance to standard chromaticity (x, y) and luminance factor (Y%) requirements shall be determined by instrumental method in accordance with ASTM E 1164 on sheeting applied to smooth aluminum test panels cut from Alloy 6061-T6 or 5052-H38. The values shall be determined on a HunterLab ColorFlex 45/0 spectrophotometer. Computations shall be done for CIE Illuminant D65 and the 2° standard observer.*

6.1.1.2 Fluorescent Colors

Conformance to standard chromaticity (x,y) and luminance factor (Y%) requirements shall be determined by instrumental method in accordance with ASTM E 991 on sheeting applied to smooth aluminum test panels cut from Alloy 6061-T6 or 5052-H38. The values shall be determined on a HunterLab ColorFlex 45/0 spectrophotometer. Computations shall be done for CIE Illuminant D65 and the 2° standard observer.*

* The instrumentally determined color values of ordinary and fluorescent colored retroreflective sheeting can vary significantly depending on the make and model of colorimetric spectrophotometer as well as the color and retroreflective optics of the sheeting (David M. Burns and Timothy J. Donahue, Measurement Issues in the Color Specification of Fluorescent-Retroreflective Materials for High Visibility Traffic Signing and Personal Safety Applications, Proceedings of SPIE: Fourth Oxford Conference on Spectroscopy, 4826, pp. 39-49, 2003). For the purposes of this document, the HunterLab ColorFlex 45/0 spectrophotometer shall be the referee instrument.

6.2 Coefficient of Retroreflection

6.2.1 Conformance to minimum requirements for Retroreflectance is determined as follows:

6.2.2 Three 8 in. x 8 in. samples spaced evenly across and down a representative piece of sheeting shall be taken. The Coefficient of Retroreflection (R_A) shall be determined for each of the three samples per ASTM E810. The average of the three values shall comply with the stated minimum table value and no single sample shall be less than 80% of the table value.

6.2.3 The observation angles shall be 0.2°, 0.5°, 1.0°.

6.2.4 The entrance angles shall be -4° and 30°.

6.2.5 For screen printed transparent colored areas or transparent colored overlay films on white sheeting, the coefficients of retroreflection shall not be less than 70% of the values for corresponding color in Table I of this specification.

6.3 Fractional Retroreflectance

The optical design of the sheeting shall be such that when measured at an entrance angle of –4° the fractional retroreflectance within a 2° observation angle cone, as defined in ASTM E808 as R_T with $\alpha_{max} = 2°$, is at least 55%.

Table I
Minimum Coefficient of Retroreflection
(cd/lux/m^2)

White	-4	30
0.2	580	220
0.5	420	150
1.0	120	45

Blue	-4	30
0.2	26	10
0.5	19	7.0
1.0	5.0	2.0

Yellow	-4	30
0.2	435	165
0.5	315	110
1.0	90	34

FYG	-4	30
0.2	460	180
0.5	340	120
1.0	96	36

Red	-4	30
0.2	87	33
0.5	63	23
1.0	18	7

FY	-4	30
0.2	350	130
0.5	250	90
1.0	72	27

Green	-4	30
0.2	58	22
0.5	42	15
1.0	12	5.0

FO	-4	30
0.2	175	66
0.5	125	45
1.0	36	14

Brown	-4	30
0.2	17	7.0
0.5	13	5.0
1.0	4.0	1.0

6.4 Color Processing

The retroreflective sheeting shall be designed to work in concert with recommended imaging systems. Color processing with compatible transparent and opaque process colors shall be possible in accordance with the sheeting manufacturer's recommendation at temperatures of 60° to 100°F (16° to 38°C) and relative humidity of 20% to 80%. The sheeting shall be heat resistant and permit force curing without staining of applied or unapplied sheeting at temperatures recommended by the sheeting manufacturer.

6.5 Shrinkage

The retroreflective sheeting shall comply with the shrinkage requirements contained in ASTM D 4956-09 section 6.6.

6.6 Adhesive

The retroreflective sheeting shall comply with the liner removal and adhesion requirements contained in ASTM D 4956-09 sections 6.8 and 6.9 respectively.

6.7 Optical Stability

Three samples of retroreflective sheeting applied to test panels and conditioned as in Section 5.0 shall each first have their photometric properties characterized by measuring the coefficients of retroreflection in accordance with ASTM E 810 at all test geometries shown in Table I. These panels shall then be exposed in an air circulating oven at 160 ± 5°F (71± 3°C) for a period of 24 hours. After exposure the panels shall be allowed to condition according to the provisions of Section 5.0. These panels will again be characterized for photometric properties by measuring the coefficients of retroreflection at all test geometries measured before exposure.

The coefficients of retroreflection measured after exposure shall be between 85% and 115% of the values measured before exposure for each of the three samples.

6.8 Fungus resistance

The retroreflective sheeting shall comply with the supplementary requirements contained in section S1 of ASTM D 4956-09.

6.9 General Characteristics and Packaging

The retroreflective sheeting as supplied shall be of good appearance, free from ragged edges, cracks and extraneous materials and shall be furnished in either rolls or sheets.

When furnished in continuous rolls, the number of splices shall not be more than two per 50 yards (45.7 m) of material, with a maximum of three pieces in any 50-yard (45.7 m) length. Splices shall be butted and shall be suitable for continuous application as furnished.

The sheeting shall be packaged in accordance with commercially accepted standards. Each carton shall clearly stipulate the brand, quantity, size, lot or run number, and color. Stored under normal conditions the retroreflective sheeting as furnished shall be suitable for use for a minimum period of one year.

7.0 Performance Requirements and Obligations

7.1 Certification

The sheeting manufacturer shall submit with each lot or shipment, a certification that states the material supplied will meet all the requirements listed herein.

7.2 Field Performance Requirements

7.2.1 For Permanent Signing – Ordinary Colors:

Sheeting manufactured of ordinary colors and processed and applied to sign blank materials in accordance with sheeting manufacturer's recommendations, shall perform effectively for at least 12 years. The retroreflective sheeting will be considered unsatisfactory if it has deteriorated due to natural causes to the extent that: (1) the sign is ineffective for its intended purpose when viewed from a moving vehicle under normal day and night driving conditions; or (2) the coefficient of retroreflection is less than the minimum specified for that sheeting during that period listed.

80% of values listed in Table I up to 7 years and
70% of values listed in Table I up to 12 years

Failure of process colors or overlay films provided and/or sold for use on recommended sheeting shall constitute a failure of the sign and shall be replaced under the manufacturer's replacement obligations (7.3).

For screen printed transparent colored areas or transparent colored overlay films on white sheeting, the coefficients of retroreflection shall not be less than 70% of the values for the corresponding integral color.

All measurements shall be made after sign cleaning according to the sheeting manufacturer's recommendations.

7.2.2 For Permanent Signing – Fluorescent Colors:

Sheeting manufactured of fluorescent colors and processed and applied to sign blank materials in accordance with sheeting manufacturer's recommendations shall perform effectively for the number of years stated in this specification. The retroreflective sheeting will be considered unsatisfactory if it has deteriorated due to natural causes to the extent that: (1) the sign is ineffective for its intended purpose when viewed from a moving vehicle under normal day and night driving conditions; or (2) the coefficient of retroreflection is less than the minimum specified for that sheeting during that period listed.

80% of values listed in Table I up to 7 years* and
70% of values listed in Table I up to 10* years

Failure of process colors or overlay films provided and/or sold for use on recommended sheeting shall constitute a failure of the entire sign and shall be replaced under the manufacturer's replacement obligations (7.3).

All measurements shall be made after sign cleaning according to sheeting the manufacturer's recommendations.

*Due to climatic conditions, the warranty in the following states will be a seven year warranty: Alabama, Arizona, Florida, Georgia, Hawaii, Louisiana, Mississippi, New Mexico, South Carolina, Texas

- 80% of values listed in Table I up to 5 years in states listed above
- 70% of values listed in Table I up to 7 years in states listed above

7.2.3 For Temporary Signing – Fluorescent Orange Colors

Sheeting manufactured of fluorescent orange and applied to sign blank material in accordance with the sheeting manufacturer's recommendations, is expected to perform effectively for a minimum of three years. The retroreflective sheeting will be considered unsatisfactory if it has deteriorated due to natural causes to the extent that: (1) the sign is ineffective for its intended purpose or (2) retains less than 50% of the coefficient of retroreflection values listed in Table I at 0.2 degrees observation, -4 degrees entrance (measured in accordance with ASTM E810).

All measurements shall be made after sign cleaning according to the sheeting manufacturer's recommendations.

Natural causes include effects of exposure to weather. Natural causes exclude (without limitation) damage from exposure to chemicals, abrasion and other mechanical damage (such as from fasteners used to mount the sign, collisions or mishandling), vandalism, or malicious mischief.

7.3 Sheeting Manufacturer's Replacement Obligation

7.3.1 For ordinary colors where it can be shown that retroreflective signs, supplied and used according to the sheeting manufacturer's recommendations, have not met the performance requirements of Section 7.2, the sheeting manufacturer shall cover restoration costs as follows for sheetings shown to be unsatisfactory during:

7.3.1.1 For the entire 12 years, the sheeting manufacturer will replace the sheeting required to restore the sign surface to its original effectiveness.

7.3.1.2 In addition, during the first seven years the sheeting manufacturer will cover the cost of restoration of the sign surface to its original effectiveness at no cost to **(Agency)** for materials and labor.

7.3.2 For fluorescent colors where it can be shown that retroreflective signs, supplied and used according to the sheeting manufacturer's recommendations, have not met the performance requirements of Section 7.2, the sheeting manufacturer shall cover restoration costs as follows for sheetings shown to be unsatisfactory:

7.3.2.1 For those states with a 10 year warranty, if the failure

occurs within the first 7 years from the date of fabrication, the sheeting manufacturer shall, at its expense, restore the sign surface to its original effectiveness.

7.3.2.2 If the failure occurs in the 8th through the 10th year from the date of fabrication, the sheeting manufacturer will furnish the necessary amount of sheeting to restore the sign surface to its original effectiveness.

7.3.2.3 Replacement sheeting shall carry the unexpired warranty of the sheeting it replaces.

7.3.2.4 For those states with a 7 year warranty, if the failure occurs within the first 5 years from the date of fabrication, the manufacturer will, at its expense, restore the sign surface to its original effectiveness.

7.3.2.5 If the failure occurs within the 6th or 7th year from the date of fabrication, the manufacturer will furnish the necessary amount of sheeting necessary to restore the sign surface to its original effectiveness.

7.3.2.6 Replacement sheeting shall carry the unexpired warranty of the sheeting it replaces.

7.3.3 For temporary signing, fluorescent orange, where it can be shown that the retroreflective sheeting fails to conform to the performance requirements of Section 7.2, the sheeting manufacturer's sole responsibility and purchaser's and user's exclusive remedy shall be:

7.3.3.1 Provide replacement sheeting. This sheeting shall carry the unexpired warranty of the sheeting it replaces

7.4 **(Agency)** Obligation

(Agency) shall be responsible for requiring the dating of all signs at the time of application. That date constitutes the start of the field performance obligation period.

8.0 Applicable Documents

The following documents, of the issues in effect on the date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

8.1 ASTM Standards

8.1.1 D 4956 Standard Specification for Retroreflective Sheeting for Traffic Control.

8.1.2 E 810 Standard Test Method for Coefficient of Retroreflection of Retroflective Sheeting.

SPECIFICATION NO. TE-007 – 2010
SPECIFICATIONS FOR HIGH INTENSITY PRISMATIC REFLECTIVE SHEETING
TRAFFIC ENGINEERING DIVISION

Note: The following Specification TE-007 contains both warranty and pre-qualification clauses directly related to product performance. (See Sections, E, H, and I.)

SECTION I - DESCRIPTION

The reflective sheeting shall consist of prismatic lens elements adhered to a synthetic resin and encapsulated by a flexible, transparent, weatherproof plastic having a smooth outer surface. The sheeting shall have a pre-coated adhesive backing protected by a plastic liner.

SECTION II - REQUIREMENTS

A. Photometric

Coefficient of Retroreflection: The coefficients of retroreflection shall be determined in accordance with ASTM E-810, for the minimum requirements of Table 1, as specified.

Table 1
Minimum Coefficient of Retroreflection
(Candelas per Lux per Square Meter)

White

	-4/5	30	40
0.2	360	175	90
0.5	150	70	45
1.0	20	10	9.0

Green

	-4/5	30	40
0.2	50	30	8
0.5	21	12	3.0
1.0	2.0	2.0	0.8

Yellow

	-4/5	30	40
0.2	270	135	65
0.5	110	60	32
1.0	14	8.5	7.0

Blue

	-4/5	30	40
0.2	30	14	5.0
0.5	13	6.0	2.0
1.0	1.0	0.8	0.5

Red

Brown

	-4/5	30	40
0.2	65	35	15
0.5	27	14	7
1.0	3.0	2.0	1.0

	-4/5	30	40
0.2	18	8.5	2.0
0.5	7.5	3.5	1.0
1.0	1.0	0.2	0.1

Orange

	-4/5	30	40
0.2	145	70	29
0.5	60	28	14
1.0	5.0	3.0	1.0

B. Color

Color shall be as specified and shall conform to the requirements for standard highway colors as defined in ASTM D 4956-05.

C. Adhesive

1. The reflective sheeting shall include a pre-coated adhesive which shall be applied exactly as specified by the sheeting manufacturer to recommended, properly prepared flat surfaces without necessity of additional adhesive coats on the reflective sheeting or application surface.

2. The protective liner attached to the adhesive shall be removed by peeling without soaking in water or other solvents and shall be easily removed after accelerated storage for 4 hours at 160 degrees F. (71 degrees C) under weight of 2.5 pounds per square inch (0.18 kg. per square cm.).

3. The adhesive coated sheeting, when applied at 72 degrees F. (22 degrees C) and conditioned for 24 hours at this temperature, shall form a durable bond to clean, smooth, corrosion and weather resistant substrates when exposed to temperatures of -30 degrees to 160 degrees F (-35 degrees to 72 degrees C).

Sheeting applied to 6" x 6" (15 cm. x 15 cm.) cleaned and etched panels of 0.040 inch (1.02 mm), 6061-T6 aluminum, conditioned for 24 hours at 72 degrees F (22 degrees C) and 50% relative humidity shall show no separation from the substrate or cracking outside immediate impact area when subjected to a 50-inch pound impact in accordance with ASTM D-2794.

D. 1. General

The reflective sheeting shall have sufficient strength and flexibility so that it can be handled, processed, and applied according to the recommendations of the sheeting manufacturer without appreciable damage. Following liner removal, the reflective sheeting shall not shrink more than 1/32" (0.79mm.) in 10 minutes nor more than 1/8" (3.18mm.) in 24 hours in any dimension per 9" (22.9cm.) square at 72 degrees F (23 degrees C)
and 50% RH.

The sheeting with liner removed, conditioned for 24 hours at 72 degrees F. and 50% RH shall be sufficiently flexible to show no cracking when slowly bent in one second's time, around 1/8" (3.18mm.) mandrel with adhesive side contacting mandrel. Note: For ease of testing, spread talcum powder on adhesive to prevent sticking to mandrel.

2. Surface

The sheeting surface shall be smooth and facilitate cleaning and wet performance, and exhibit 85 degree gloss meter rating of not less than 50 (ASTM D 523-62T).

The sheeting shall permit cutting and color processing at temperatures of 60 degrees - 100 degrees F (15 degrees - 39 degrees C) and relative humidities of 20-80%.

E. Effective Performance Life

The sheeting manufacturer shall submit with each lot or shipment, a certification which states that the material supplied will meet all the requirements listed herein.

1. Reflective sheeting which is processed, applied to approved sign base materials, and cleaned, according to manufacturer's recommendations for traffic control signs, shall be considered as performing effectively for the number of years stated by the bidder if the sheeting has not deteriorated due to natural causes to the extent that: (1) the sign is ineffective for its intended purpose when viewed from a vehicle, or (2) the average nighttime reflective brightness is less than that specified in Table III below. In accordance with Section II, E, 3. which follows the bidder shall be required to replace all sheeting which fails to meet performance requirements in Table III below. **

EFFECTIVE PERFORMANCE LIFE - TABLE III

Sheeting Type and Color	Average minimum candlepower per square foot at 0.2 degree divergence and -4 degree incidence*

Effective Performance Life	Years 1-7	Years 8-10
White	288	252
Green	40	35
Yellow	216	189
Red	52	45
Blue	24	21

	Years 1-3
Orange	80

* Candlepower measurement shall be made, following sign cleaning, in accordance with procedures recommended in Section IIA.
** Performance years for each color shall be stated by the bidder

2. The reflective sheeting exposed for 48 months in Jefferson Parish at 45 degrees south facing, shall not support fungus growth and accumulate dirt to the extent that the reflective brightness before cleaning is less than 75% of the reflective brightness after cleaning, when measured at 0.2 divergence and -4 degrees incidence.

3. Where it can be shown that sheeting's supplied and used according to the sheeting manufacturer's recommendations have not met the performance requirements of Section E. 1, the sheeting manufacturer shall cover restoration costs as follows for sheeting's shown to be unsatisfactory during:

a) The entire ten years: the sheeting manufacturer will replace the sheeting required to restore the sign surface to its original effectiveness. Exception is orange, the sheeting manufacturer will replace the sheeting required to restore the sign surface to its original effectiveness for first 3 years only.

b) In addition, during the first seven years: the sheeting manufacturer will cover the cost of restoring the sign surface to its original effectiveness at no cost to Jefferson Parish for materials or labor. Exception: orange, there is no provision for restoring sign surface to original effectiveness.

Jefferson Parish requires sign dating of all signs at the time of application. That date constitutes the start of the field performance obligation period.

F. General Characteristics and Packaging

The reflective sheeting as supplied shall be free from ragged edges, cracks, and extraneous materials, and shall be furnished in both rolls and sheets. When the reflective sheeting is furnished in continuous rolls the average number of splices shall not be more than three per 50 yards (45.7 m) of material with a minimum of 4 splices in any 50 yard length. Splices shall be suitable for continuous application as supplied.

Materials must be delivered within five (5) weeks of receipt of purchase order.

Sheeting shall be packaged in accordance with commercially accepted

standards.

The reflective sheeting as supplied, stored under normal conditions, shall be suitable for use for at least one year after purchase.

NOTE: Metric equivalents in parenthesis.

G. Technical Assistance

a) Instruction and Training

The manufacturer supplying the retroreflective sheeting shall provide the services of a qualified technician for instruction and training at the primary sign manufacturing facility designated by Jefferson Parish. This instruction shall be available on an annual basis at no additional cost, and shall include but not be limited to, training films, material application, equipment operation, silk screening techniques, packaging, storage and other proven sign shop practices as they apply to the reflective sheeting supplied by the manufacturer, and to assure that the resulting signs can comply with the applicable specifications.

Additional on-site technical assistance by the manufacturer supplying the retroreflective sheeting shall be provided each of the sign shops designated in the bid invitation. This assistance shall be provided at least once during each quarter of sign production.

b) Manufacturer must supply materials in all widths and colors specified. No partial bids will be accepted.

c) Compliance

Failure to comply with the requirements and schedules of parts (a), (b), and (c) of this section shall be cause for cancellation of contract.

d) Patent Liability Protection

Seller will pay any damages, costs of fines resulting from any claims against Jefferson Parish for infringement or alleged infringement of third-party patents by product supplied by Seller under this specification. The costs paid by Seller shall include legal and court costs deemed reasonably necessary by Jefferson Parish Attorney in defending against such claims.

H. Test Deck Performance

The manufacturer supplying materials specified herein must have supplied samples of these materials in each color for mounting on panels of the test deck located at the Jefferson Parish Sign and Signal Shop, 2100 Dickory Avenue, Harahan, LA.

These materials must be mounted and exposed to continuous weather conditions for three years prior to bid opening. It is the responsibility of the manufacturer to insure that mounting has been accomplished. Successful performance of the product bid must be demonstrated continuously for a minimum of four years on this deck or actual field performance in Jefferson Parish in order for the product to be qualified as meeting these specifications. In lieu of test deck exposures, materials (sheeting, process colors, overlay films) shall be approved for use, when, in the opinion of this agency, sufficient evidence and certification from the manufacturer exists to ensure that the materials and services offered can reliably conform to this specification. Successful performance shall include, but not be limited to continuous adhesion and lamination, shrinkage or distortion, retained color, chromatic quality and reflectivity. Failure to comply with this section of these specifications shall require disqualification and rejection of the manufacturer's product for the bid. See Sec. E (2).

I. Warranty Required

The manufacturer of the materials specified herein shall warrant and guarantee the materials for ten (10) years from the date of fabrication, three (3) years from the date of fabrication for orange sheeting, when the materials have been applied in accordance with the manufacturer's recommendations which must be supplied with the bid, and in accordance with the provisions of this specification. The warranty shall hold the manufacturer responsible for replacement of materials which fail to meet the effective performance life requirements stated herein. See Section E (3). Additionally, the manufacturer shall restore the sign surface to original effectiveness at no cost to Jefferson Parish for materials or labor during the first seven (7) years after fabrication, excluding orange sheeting. The written warranty must be signed by authorized corporate officer of manufacturer and included with the bid. Sales, service, or agent signatures will not be considered to meet the requirements of this specification and shall require rejection of the bid.

SPECIFICATION NO. TE-008 – 2010
SPECIFICATION FOR ENCLOSED LENS REFLECTIVE SHEETING
TRAFFIC ENGINEERING DIVISION

Note: The following Specification TE-008 contains both warranty and pre-qualification clauses directly related to product performance. See Sections, E, H.

SECTION I - DESCRIPTION

The reflective sheeting shall consist of spherical lens elements embedded within a transparent plastic having a smooth, flat outer surface. The sheeting shall be weather resistant and have a protected precoated adhesive backing.

SECTION II - REQUIREMENTS

A. Photometric

1. Background- The reflective sheeting shall have the following coefficients of retroreflection expressed as the average of representative readings over the entire surface of a panel. Measurements shall be conducted in accordance with ASTM E810 "Standard Test Method for coefficient of Retroreflection of Retroreflective Sheeting."

TABLE I – R_A (Candlepower/Footcandle/Square Foot)

	White		Yellow		Red	
Div. Ang. Inc. Ang.	.2 deg.	.5 deg.	.2 deg.	.5 deg.	.2 deg.	.5 deg.
-4 deg.	70.0	30.0	50.0	25.0	14.5	7.5
30 deg.	30.0	15.0	22.0	13.0	6.0	3.0

	Blue		Green	
Div. Ang. Inc. Ang.	.2 deg.	.5 deg.	.2 deg.	.5 deg.
-4 deg.	4.0	2.0	9.0	4.5
30 deg.	1.7	0.8	3.5	2.2

	Orange		Brown	
Div. Ang. Inc. Ang.	.2 deg.	.5 deg.	.2 deg.	.5 deg.
-4 deg.	25.0	13.5	2.0	1.0
30 deg.	7.0	4.0	1.0	0.5

2. Applied or Demountable Copy- Reflective Sheeting for all sign copy including letters, numerals, symbols, borders, and route markers shall be White which has been carefully selected by the manufacturer for uniformity of day and night appearance. No further matching shall be necessary.

3. Rainfall Performance - The brightness of the reflective sheeting, totally wet by rain,

shall not be less than 90% of the above values. Wet performance measurements shall be conducted in conformance with Standard RAINFALL TEST specified in Federal Specification L-S-300C "Sheeting and Tape, Reflective, Nonexposed Lens Adhesive Backing."

B. Color

Color shall be as specified and shall conform to ASTM D 4956-05, Table 5. Luminance factors shall conform to ASTM D 4956-05, Table 6.

C. Adhesive

1. The reflective sheeting shall include a pre-coated pressure adhesive which may be applied without necessity of additional adhesive coats on the reflective sheeting or application surface.

2. The protective liner attached to the adhesive shall be removed by peeling without soaking in water or other solvents and shall be easily removed after accelerated storage for four hours at 160 degrees F. (72 deg. C) under weight of 2.5 pounds per square inch (0.18 kg. per square cm).

3. The adhesive coated sheeting, when applied at 72 deg. F (22 deg. C) and conditioned for 24 hours at this temperature, shall form a durable bond to clean, smooth, corrosion and weather resistant substrates when exposed to temperatures of -30 deg. to 160 deg. F. (-35 deg. to 72 deg. C). Sheet is applied to 6.0 in. x 6.0 in. (15.0 cm. x 15.0 cm) cleaned and etched panels of 0.040 inch (1.00 mm) 6061-T6 aluminum, conditioned for 24 hours at 72 deg. F. (22 deg. C) and 50% relative humidity, shall show no separation from the substrate or cracking outside immediate impact area when subjected to impact from a 2 pound weight with a 5/8 inch rounded tip dropped from a 10 inch pound setting on a Gardner Variable Impact Tester.

D. Film

1. General - The reflective sheeting shall have sufficient strength and flexibility so that it can be handled, processed, and applied according to the recommendations of the sheeting manufacturer without appreciable stretching, tearing, or other damage. It shall permit application over and conformance to moderate, shallow embossing characteristics of certain sign borders and symbols. Following liner removal, the reflective sheeting shall not shrink more than 1/32" (0.79 mm) in 10 minutes nor more than 1/8" (3.18 mm) in 24 hours in any dimension per 9.0" (22.9 cm) square at 72 deg. F. (22 deg. C) and 50% RH.

The sheeting with the liner removed and conditioned for 24 hours at 72 deg. F (22 deg. C) and 50% RH, shall be sufficiently flexible to show no cracking when slowly bent, in one second's time, around a 1/8" (3.18 mm) mandrel with adhesive contacting the mandrel. NOTE: For ease of testing, spread talcum powder on adhesive to prevent

sticking to the mandrel.

2. Surface - The sheeting surface shall be smooth and flat, facilitate cleaning and wet performance, and exhibit 85 deg. glossmeter rating of not less than 40 (ASTM-D-523-62T). The sheeting surface shall be readily processed and compatible with recommended transparent and opaque process colors and show no low of the color coat with normal handling, cutting, and application.

The sheeting shall permit cutting and color processing at temperatures of 60-100 deg. F. (15 deg. - 28 deg. C) and relative humidity's of 20-80%. The sheeting shall be heat-resistant and permit force curing without staining of unapplied sheeting at temperatures up to 150 deg. F (65 deg. C) and up to 200 deg. F (93 deg. C) on applied sheeting.

E. Effective Performance Life and Warranty

1. Reflective sheeting's processed, applied to approved sign base materials, and cleaned, in accordance with manufacturer's recommendations for their use on traffic control signs, shall be considered as performing effectively for the number of years stated by the bidder if the sheeting's have not deteriorated due to natural causes to the extent that: 1) the sign is ineffective for its intended purpose when viewed from a vehicle, or 2) the average night time reflective brightness is less than that specified in Table III below. The bidder's only liability shall be replacement of all reflective sheeting failing to give satisfactory performance for the number of years stated by the bidder.

TABLE III - EFFECTIVE PERFORMANCE LIFE

Sheeting Type & Color	Average Specific Intensity per Square Foot (Candlepower/Foot Candle/Square Foot divergence) and -4 deg. incidence* - 7 yrs. Field Service	Effective Performance Life**
White	35	7 Years
Yellow	20	7 Years
Red	5	7 Years
Blue	2	7 Years
Green	3	7 Years
Orange	10	7 Years

*Candlepower measurement shall be made, following sign cleaning, in accordance with procedure recommended in Section IIA.

**Performance years for each color shall be stated by the bidder.

2. The reflective material exposed on a Jefferson Parish test-deck facility for 36 months in Harahan at 45 deg. south facing, shall not support fungus growth and accumulate dirt to the extent that the reflective brightness before cleaning is less than 75% of the reflective brightness after cleaning, when measured at 0.2 divergence and -4 deg. incidence.

3. The sheeting surface may be readily refurbished by cleaning and clear overcoating in accordance with the manufacturer's recommendations.

F. General Characteristics and Packaging

The reflective sheeting as supplied shall be of good appearance, free from ragged edges, cracks, and extraneous materials, and shall be furnished in both rolls and sheets. When the reflective sheeting is furnished in continuous rolls, the average number of splices shall not be more than three per 50 yards of material with a maximum of four splices in any 50-yard length. Splices shall be butted or overlapped and shall be suitable for continuous application as supplied.

Sheeting shall be packaged in accordance with commercially accepted standards.

Stored under normal conditions, the reflective sheeting as supplied shall be suitable for use for a period of at least one year.

NOTE: Metric equivalents in parenthesis.

G. Equipment, Delivery, Service

The manufacturer supplying the retroreflective sheeting shall provide service for recommended sheeting application equipment and certify that trained personnel will be available on 24 hrs notice to render such service.

The manufacturer must supply materials in all widths and colors specified. No partial bids will be accepted.

H. Test Deck Performance

The manufacturers supplying materials specified herein must have supplied samples of these materials in each color for mounting on panels of the test deck located at the Jefferson Parish Sign and Signal Shop, 2100 Dickory Avenue, Harahan, LA. These materials must be mounted and exposed to continuous weather conditions at 45 deg. south facing for three years prior to bid opening. It is the responsibility of the manufacturer to insure that mounting has been accomplished. Successful performance of the product bid must be demonstrated continuously for a minimum of 3 yrs. on this deck or actual field performance within the Parish in order for the product to be qualified as meeting these specifications. Successful performance shall include, but not be limited to continuous adhesion and lamination, shrinkage or distortion, retained color, chromatic quality and reflectivity. Failure to comply with this section of these specifications shall require dis-qualification and rejection of the manufacturer's product for the bid.

SPECIFICATION NO. TE-009 - 2010
SPECIFICATION FOR PIGMENTED PLASTIC FILMS –
PRESSURE SENSITIVE ADHESIVE
TRAFFIC ENGINEERING DIVISION

SECTION I - DESCRIPTION

The material shall consist of a flexible, pigmented plastic film, completely pre-coated with a pressure sensitive adhesive. The adhesive shall be protected by a treated paper liner which shall be removable without soaking in water or other solvents. The material shall be available in the colors listed below in Section II-D.

SECTION II - PROPERTY REQUIREMENTS

A. Thickness

The thickness of the plastic film with adhesive shall be a minimum of 0.003 inches and a maximum of 0.0045 inches.

B. Film

The unapplied shall be readily processed and insure adequate adhesion with process or printing inks recommended by the manufacturer.

1. Flexibility

The material shall be sufficiently flexible to permit application over and conform to moderately contoured surfaces.

2. Gloss

The film shall have an initial 60-degree gloss value of 35 (minimum), when tested in accordance with ASTM Method No. D-523-67, measuring at least three portions of the film to obtain uniformity.

C. Adhesive

The pre-coated adhesive shall form a durable bond to smooth, clean, corrosion and weather resistant surfaces shall be of uniform thickness, no-corrosive to applied surfaces and shall have no staining effect on the film.

1. Adhesion

The adhesive shall adhere securely at temperatures of –30 degrees F. to 200 degrees F., when subjected to any temperatures within this range the film shall not crack, chip, or peel voluntarily, nor shall it be removable from the panel in one piece without the aid of a tool.

2. Sunlight Resistance
   There shall be no effect on the adhesive tack or performance following exposure of the adhesive face under a new General Electric RS Sunlamp for a period of six hours at a distance of eight inches.

D. Exterior Exposure
The unprocessed material shall withstand the year's exposure, listed below by color, in a vertical, south facing exterior exposure in Texas.

Color	Years Performance
White	7 years
Black	7 years
Yellow	6 years
Aluminum	3 years
Insignia Blue	6 years
Transparent	5 years
Red	3 years (Dark Red 6 years)
Gold	3 years

During the above listed exposure, the unprocessed material shall show no appreciable discoloration, cracking, crazing, blistering, delamination, or loss of adhesion. A slight amount of chalking is permissible.

The film shall not support fungus growth.

E. Dimensional Stability
The material shall show not more than 1/64" shrinkage in any direction from edge of panel (when prepared in accordance with Para. H), after being subjected to a temperature of 150 degrees F. for 48 hours.

F. Heat Resistance
The material, applied according to Paragraph H. shall be heat resistant enough to retain adhesion after one week at 150 degrees F.

G. Solvent and Chemical Resistance
The material (when prepared in accordance with Para. H) shall withstand immersion in the following liquids at 70 degrees – 90 degrees F., showing no appreciable decrease in adhesion, color, or general appearance.

Liquids	Time, Hours
Reference Fuel (MIL-F-8799A) (15 parts xylol (85 parts mineral spirits by weight	1
Distilled Water	24
SAE No. 20 Motor Oil	24

H. Preparation of Test Panels
Test panel shall be prepared using 6-1/2" x 6-1/2" piece of the plastic film, applied to a clean 6" x 6" aluminum panel, premasked or as recommended by the manufacturer, trimmed evenly at the edge of the panel, and aged for 48 hours at 70 degrees – 90 degrees F.

I. Shelf Life Storage
The material, when stored according to instructions of manufacturer in a clean area free from exposure to excessive heat, moisture, and direct sunlight, shall be suitable for use after date of purchase as follows: Unprinted film – 1 year, Printed film – additional year.

J. General Characteristics and Packaging
The plastic film shall be furnished in rolls, cut sheets or characters as may be specified. The film, as supplied, shall be free from ragged edges, streaks, blisters, foreign matter, or other surface imperfections which would make it unsuitable for the intended usage, and shall be readily cut with scissors, knife, blade, shears, or other production methods. Complete and detailed instructions for mounting the plastic film shall be available from the manufacturer.

Rolls, sheets or letters shall be individually packaged in suitable containers and in such a manner that no damage or defacement may occur to the plastic film during transport to destination.

SPECIFICATION NO. TE-009A – 2010
SPECIFICATION FOR ELECTRONICALLY CUTTABLE COLOR FILMS FOR USE ON RETROREFLECTIVE SHEETING
TRAFFIC ENGINEERING DIVISION

Note: The following specification (TE 009A) contains warranty clauses directly related to product performance.

1.0 Scope

This document covers flexible, transparent, durable films designed to be applied to retroreflective materials for the creation of traffic control signs and devices.

2.0 Applicable Documents

The following documents, of the issue in effect on the date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

2.1 ASTM Standards

2.1.1 B 209 Specification for Aluminum and Aluminum Alloy Sheet and Plate.

2.1.2 D 523 Standard Method for Test for Specular Gloss.

2.1.3 D 4956 Standard Specification for Retroreflective Sheeting for Traffic Control.

2.1.4 E 284 Standard Definition of Terms Relating to Appearance of Materials.

2.1.5 E 308 Computing the colors of Objects by Using the CIE System.

2.1.6 E 810 Standard Test Method for Coefficient of Retroreflective of Retroreflective Sheeting.

2.1.7 E 1164 Standard Practice for Obtaining Spectrophotometric Data for Object-Color Evaluation.

2.2 FP-03 Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects.

3.0 Description

Electronic cuttable films shall consist of durable, transparent, colored films coated with a transparent pressure sensitive adhesive protected by a removable liner. The films are designed to be cut on knife over roll (sprocket fed or friction fed) and flat bed electronic cutting machines. The films shall be available in standard traffic colors, be dimensionally stable, and be designed to optimally cut, weed, lift, and transfer. Use of electronic cuttable films will not require the using agency to release any volatile organic compounds.

4.0 Test Methods

4.1 Test Conditions. Unless otherwise specified herein, all applied and unapplied test samples and specimens shall be conditioned at the standard conditions of 73 $\pm$ 3 degrees F (23 $\pm$ 1.5 degrees C) and 50 $\pm$ 5% relative humidity for 24 hours prior to testing.

4.2 Test Panels. Unless otherwise specified herein, when tests are to be performed using test panels, the specimens of retroreflective and/or overlay film(s) shall be applied to smooth aluminum cut from ASTM B-209 Alloy 5052-H36, 5052-H38, 5154-H38 or 6061-T6 sheets on 0.020 inch (0.051 cm), 0.040 inch (0.102 cm), or 0.063 inch (0.160 cm) thickness. The aluminum shall be degreased and lightly acid etched before the specimens are applied. The specimens shall be applied to accordance with the recommendations of the reflective sheeting and electronic cuttable film manufacturer(s).

5.0 Physical Requirements

5.1 Color Requirements. When electronic cuttable film is applied to retroreflective sheeting, the resulting color of the composite sheeting will conform to Federal Specification FP-03, Section 718 and ASTM D 4956 or to the using agency specification for the appropriate retroreflective sheeting to which it is applied.

5.1.1 Color Test. Conformance to color requirements shall be determined by instrumental method in accordance with ASTM E 1164 on sheeting applied to aluminum test panels. The values shall be determined on a HunterLab Labscan 6000 0/45 Spectrocolorimeter with option CMR 559 {or approved equal 0/45 (45/0) instrument with circumferential viewing (illumination)}. Computations shall be done in accordance with ASTM E 308 for the 2 degrees observer.

5.2 Coefficient of Retroreflection, Ra. When electronic cuttable film is applied to retroreflective sheeting, the composite will conform to the percentage retained of the minimum coefficient of retroreflection specified by the using agency and the manufacturer for the retroreflective sheeting when the retroreflective sheeting is screen processed. The coefficient of retroreflection shall be determined in accordance with ASTM E 810.

5.2.1 Units. Coefficients of retroreflection Ra shall be specified in units of candelas per foot candle per square foot (candelas per lux per square meter).

5.2.2 The observation angles shall be 0.2 and 0.5 degrees unless otherwise specified.

5.2.3 The entrance angles shall be - 4 and 30 degrees unless otherwise specified.

5.2.4 Retroreflective sheeting with datum marks shall be tested in the orientation specified by the manufacturer. If no datum mark is supplied, the sheeting shall be rotated to determine the minimum Ra which shall be reported without averaging.

5.3 Specular Gloss. The electronic cuttable film shall have an 85 degrees specular gloss of not less than 50 when tested in accordance with ASTM D 523.

5.4 Processing and Cuttability. The electronic cuttable film shall permit cutting, weeding, masking with transfer tape, lifting, and application to retroreflective sheeting when used in accordance with manufacturer's recommendations at temperatures between 65 degrees and 95 degrees F (18.3 degrees and 35.0 degrees C) and relative humidities between 30% and 70%. The film shall lay flat with minimal edge curl and be dimensionally stable.

5.5 Adhesive Liner. The protective liner attached to the adhesive shall be removable by peeling without soaking in water or other solutions, without breaking, tearing, or removing any adhesive from the electronic cuttable film. The liner shall have a controlled release from the adhesive coated film sufficient to allow cutting without the film popping off from the liner while still allowing the liner to easily be peeled from the film.

5.5.1 Film with punched edges for use on sprocket fed knife over roll cutters shall be edge scored and weeded to remove film

in the punched area as a means of eliminating adhesive build up on the sprockets.

5.6 Resistance to Accelerated Outdoor Weathering. When electronic cuttable film is applied to retroreflective sheeting, the surface of the film shall be weather resistant and show no appreciable cracking, blistering, crazing, or dimensional change after 2 years unprotected outdoor exposure, facing the equator and inclined 45 degrees from the vertical. Following weather exposure, panels shall be washed in 1% detergent solution for 45 seconds, rinsed thoroughly with clean water, blotted dry with a soft clean cloth and brought to equilibrium at standard conditions. After cleaning, the coefficient of retroreflection shall not be less than the value specified by the using agency for the retroreflective sheeting when the retroreflective sheeting is screen processed.

5.6.1 Show no appreciable evidence of cracking, scaling, pitting, blistering, edge lifting or curling or more that 1/32 inch (0.08cm) shrinkage or expansion.

5.6.2 Show acceptable colorfastness when tested as in 5.7.

5.6.3 Retained reflectivity shall be the same as the using agency specification for screen processed retroreflective sheeting of the type being tested.

5.6.4 The electronic cuttable film shall not be removable from the retroreflective sheeting without damage.

Retroflective performance measurements made after weather exposure shall be made only at angles of 0.2 degrees observation and - 4 degrees entrance. Where more that one panel of a color is measured, the coefficient of retroreflection shall be the average of all determinations.

5.7 Colorfastness. After the specified outdoor weathering, the sheeting shall conform to the color requirements in ASTM D 4956-05 Tables 5 and 6.

5.8 General Characteristics and Packaging.

5.8.1 Roll Goods. When supplied as roll goods, the electronic cuttable film shall be of good appearance, free from ragged edges, cracks and extraneous materials. The maximum number of splices in each roll shall be three per 50 yards of material. Splices shall be butted. The sheeting shall be

packed snugly in corrugated fiberboard cartons, in accordance with commercially accepted standards. Each carton shall clearly stipulate the brand, quantity, size, lot or run number, and color. Stored under normal conditions the electronic cuttable film as furnished shall be suitable for us for minimum period of one year.

5.8.2 Sign Faces. When supplied as finished sign face or mounted sign, the sign face, made of electronic cuttable film and retroreflective sheeting, shall comply with the appearance, specification, and good workmanship designated by the using agency for sign faces constructed of screen processed retroreflective sheeting of the same type.

6.0 Performance Requirements and obligations

6.1 Certification. The film manufacturer shall, upon request, submit with each lot or shipment, a certification which states that the material supplied will meet all of the requirements listed herein.

6.2 Field Performance Requirements. The electronic cuttable film applied to retroreflective sheeting, both materials applied in accordance with the manufacturer's recommendations, shall as a composite perform with the same effective performance life as the using agency specifies for that type of retroreflective sheeting when screen processed. The composite sign will be considered unsatisfactory if it has deteriorated due to natural causes to the extent that: (1) the sign is ineffective for its intended purpose when viewed from a vehicle under normal day and night driving conditions; or (2) the coefficient of retroreflection is less than the minimums specified by the using agency for the retroreflective sheeting when screen processed.

6.3 Electronic Film Manufacturer's Replacement Obligation. Where it can be shown that retroreflective traffic signs with electronic cuttable film supplied and used according to the film manufacturer's recommendations have not met the performance requirements of Section 6.2, the film manufacturer shall cover restoration costs as provided in the using agency specification for the retroreflective sheeting when screen processed.

7.0 Technical Assistance Requirements

7.1 Instruction and Training. The manufacturer supplying the electronic cuttable film shall provide the services of a qualified technician for instruction and training at the primary sign manufacturing facility designated by the agency. This instruction shall be available on a quarterly basis at no additional cost, and shall include but not limited to, training films, material applications, equipment operation, packaging, storage and other proven sign shop practices as they apply to the electronic cuttable film supplied by the manufacturer, and to assure that the resulting signs can comply with the applicable specifications. Additional on-site technical assistance by the manufacturer supplying the electronic cuttable film shall be provided at each of the sign shops designated in the bid invitation. This assistance will be provided at least once each quarter of sign production, if required.

MARKET TEST SPECIFICATION FOR DURABLE, RETROREFLECTIVE, PREFORMED, PATTERNED PAVEMENT MARKINGS WITH PRE-COATED PRESSURE SENSITIVE ADHESIVE

TE-010-2010

3M™ Stamark™ Pavement Marking Tape Series 310

March 2010

MARKET TEST SPECIFICATION FOR DURABLE, RETROREFLECTIVE, PREFORMED, PATTERNED PAVEMENT MARKINGS WITH PRECOATED PRESSURE SENSITIVE ADHESIVE

March 2009

I. DESCRIPTION

This work shall consist of furnishing and installing retroreflective preformed patterned pavement markings in accordance with this provision and in reasonably close conformance to the dimensions and lines shown on the plans or established by the engineer.

II. MATERIALS - GENERAL

The preformed patterned markings shall consist of white or yellow films with clear and/or yellow-tinted microcrystalline ceramic beads incorporated to provide immediate and continuing retroreflection. These films shall be manufactured without the use of lead chromate pigments or other similar, lead-containing chemicals.

Preformed words and symbols shall conform to the applicable shapes and sizes as outlined in the "Manual on Uniform Traffic Control Devices for Streets and Highways."

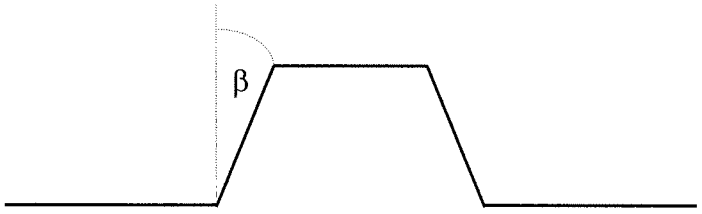
The preformed markings shall be capable of being adhered to asphaltic cement concrete and Portland cement concrete by a pre-coated pressure sensitive adhesive. A surface preparation adhesive may be used to precondition the pavement surface. The preformed markings shall conform to pavement contours by the action of traffic. The pavement markings shall be capable of application on new, dense and open-graded asphalt concrete wearing courses during the paving operation in accordance with the manufacturer's instructions. After application, the markings shall be immediately ready for traffic. The bidder shall identify proper surface preparation adhesives (where necessary) to be applied at the time of application, all equipment necessary for proper application, and recommendations for application that will assure effective product performance. The preformed markings shall be suitable for use for one year after the date of receipt when stored in accordance with the manufacturer's recommendations.

III. CLASSIFICATION

The markings shall be highly durable, retroreflective, pliant polymer materials designed for longitudinal and symbol/legend markings subjected to medium traffic volumes and wear conditions such as shear action from crossover or encroachment on typical longitudinal configurations such as edge lines and lane lines.

IV. REQUIREMENTS

Composition: The retroreflective pliant polymer pavement markings shall consist of a mixture of high-quality polymeric materials, pigments and glass beads distributed throughout its base cross-sectional area, and an embedded reinforcing net, and a reflective layer of microcrystalline ceramic beads bonded to a durable polyurethane topcoat surface. The patterned surface shall have approximately 20% + or - 10% of the surface area raised and presenting a near vertical face (ß angle of 0° to 45°) to traffic from any direction. (See diagram below.) The channels between the raised areas shall be substantially free of exposed beads or particles.



Reflectance: The white and yellow markings shall have the following initial expected retroreflectance values as measured in accordance with the testing procedures of ASTM D4061. The photometric quantity to be measured shall be coefficient of retroreflected luminance (R_L) and shall be expressed as millicandelas per square foot per foot-candle [(mcd • ft^{-2}) • fc^{-1}]. The metric equivalent shall be expressed as millicandelas per square meter per lux [(mcd • m^{-2}) • lx^{-1}]. The test distance shall be 100 feet (30 m).

EXPECTED INITIAL REFLECTANCE

	White	Yellow
Entrance Angle	88.76°	88.76°
Observation Angle	1.05°	1.05°
Retroreflected Luminance R_L (mcd • ft^{-2}) • fc^{-1})	500	300

*These retroreflectance values are based on dark room photometric readings per ASTM D4061.

Beads: Index of Refraction: All microcrystalline ceramic beads bonded to the polyurethane-coated, patterned surface of the material shall have a minimum index of refraction of 1.9 when tested using the liquid oil immersion method. The glass beads mixed into the pliant polymer shall have a minimum index of refraction of 1.5 when tested by the liquid oil immersion method.

TESTING PROCEDURE FOR REFRACTIVE INDEX OF BEADS BY LIQUID IMMERSION

I. EQUIPMENT REQUIRED:

A. Microscope (minimum 100X magnification)

B. Light source - preferably sodium light or other monochromatic source, but not absolutely essential

C. Refractive index liquids*

D. Microscope slide and slide cover

E. Mortar and pestle

*Available from R.P. Cargille Laboratories, Inc., Cedar Grove, NJ.

II. PROCEDURE:

A. Using the mortar and pestle, crush a few representative beads and place a few of these crushed particles on a microscope slide.

B. Place a drop of a refractive index liquid, with an index as close to that of the glass as can be estimated, on the particles.

C. Cover the slide with a microscope slide cover and view the crushed particles by transmitted light normal to the slide surface (illuminated from the bottom).

D. Adjust the microscope mirror to allow a minimum light intensity for viewing. This is particularly important if sodium light is not used.

E. Bring a relatively flat and transparent particle into focus.

F. By slightly raising and lowering the objective (microscope tube), look for one or both of the following:

1. Becke Line - This light line will appear to move either into the particle or away from it. In general, if the objective is raised, the line will move toward the material of higher refractive index; if the objective is lowered, the line will move toward the material of lower index.

2. Variation in Particle Brightness - When raising the object from a sharp focus, the particle will appear to get brighter or darker than the surrounding field. If it becomes brighter, the glass has a higher refractive index than the liquid. If it becomes darker, the glass has a lower refractive index than the liquid. In both cases, the opposite will be true if the object is lowered.

G. This test can be used to confirm that the beads are above or below a specified index. It can also be used to give an accurate determination of the index (+ or - 0.001). This is done by using several refractive index liquids until a match or near match of indices occurs. The index of the glass will equal that of the liquid when no Becke line and no variation in bead brightness can be observed.

The size and quality of the beads shall be such that the performance requirements for the retroreflective pliant polymer shall be met.

Acid Resistance: The beads shall show resistance to corrosion of their surface after exposure to a 1% solution (by weight) of sulfuric acid. The 1% acid solution shall be made by adding 5.7cc of concentrated acid into 1000cc of distilled water. CAUTION: Always add the concentrated acid into the water, not the reverse. The test shall be performed as follows:

Take a 1-inch by 2-inch sample, adhere it to the bottom of a glass tray and place just enough acid solution to completely immerse the sample. Cover the tray with a piece of glass to prevent evaporation and allow the sample to be exposed for 24 hours under these conditions. Then decant the acid solution (do not rinse, touch or otherwise disturb the bead surfaces) and dry the sample while adhered to the glass tray in a 150° F. (66° C.) oven for approximately 15 minutes.

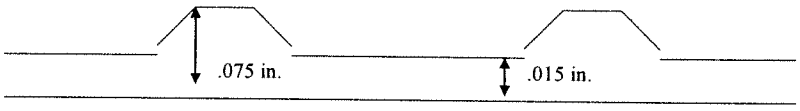
Microscopic examination (20X) shall show no more than 15% of the beads having a formation of a very distinct opaque white (corroded) layer on their entire surface.

Color: The preformed markings shall consist of white and yellow films with pigments selected and blended to conform to standard highway colors.

Skid Resistance: The patterned surface of the retroreflective pliant polymer shall provide an initial average skid resistance value of 45 BPN when tested according to ASTM E303 except values shall be taken in one direction and then at a 45° angle from that direction. These two values shall then be averaged to find the skid resistance of the patterned surface.

Patchability: The pavement marking material shall be capable of use for patching worn areas of the same type in accordance with manufacturer's instructions.

Thickness: The patterned material without adhesive shall have a minimum caliper of 0.075" (75 mils) at the thickest portion of the patterned cross-section and a minimum caliper of 0.15" (15 mils) at the thinnest portion of the cross-section.



V. WARRANTY

The manufacturer shall warrant that pavement marking material sold for longitudinal and symbol and legend pavement marking applications in the United States and Canada will remain effective for its intended use under normal traffic conditions and meet the minimum retained coefficient of retroreflection value of 100 millicandelas per foot squared per foot-candle (measured at 1.05° observation and 88.76° entrance angles) subject to the following provisions:

TABLE 1

APPLICATION*	WARRANTY PERIOD
Longitudinal Markings	2 years
Symbols and Legends	1 year

Note: Entrance angle 88.76° and Observation Angle 1.05° represent a simulated driver viewing geometry at a 30 meter distance.
*Applications in mountainous, heavy snowfall areas above 5,000 ft. (1500m) are not covered by this warranty.

If the pavement markings are applied in accordance with all the manufacturer's application recommendations and fail during the warranty period, fail to adhere to the roadway, or fail due to complete wear-through during the warranty period shown above (from the date of installation), the manufacturer's sole responsibility and purchaser's and user's exclusive remedy shall be:

The manufacturer will provide the replacement materials that will restore the pavement marking retroreflectivity values to warranty levels or greater.

Conditions

Such failure must be solely the result of design or manufacturing defects in the pavement marking material and not of outside causes such as improper installation or substrate failure. Failure to follow recommended application procedures will void this warranty.

Damage to pavement markings caused by snow removal equipment is not covered under this warranty.

A visual night inspection must be made with a manufacturer's representative and a customer representative present to identify areas of the installation which appear to be below the minimum retained reflectance values of 100 millicandelas per foot squared per foot-candle. Areas which appear to be below the minimum retained reflectance value shall be identified as "zones of measurement." To qualify for material replacement, a "zone" must be at least 360 feet in road length and consist of either edge lines, center lines or lane lines, but not in combination, or a single word or symbol. Detailed reflectance measurement procedures are provided in the product bulletin provided by the manufacturer.

VIII. INSTALLATION

The markings shall be applied in accordance with the manufacturer's installation instructions. Marking configurations shall be in accordance with the "Manual on Uniform Traffic Control Devices."

When markings are specified in the contract for newly paved asphalt concrete surfaces, they shall be applied before public traffic is allowed on the freshly paved surface. Preferably, the markings should be inlaid in the fresh surface during final rolling of the mat, but in any case they shall be applied before the close of the shift on the day which the surface is paved. These markings can also be overlaid on existing pavement surfaces.

IX. CONTRACT UNITS AND BASIS FOR PAYMENT

Linear pavement markings will be measured in linear feet complete-in-place for the width specified.

Retroreflective preformed pavement markings will be paid for at the contract unit price, which shall be full compensation for cleaning and preparing the pavement surface, for furnishing and placing all materials, and for all materials, labor, tools, equipment and incidentals necessary to complete the work.

Payment will be made under:

Pay Item	Pay Unit
Preformed Pavement Marking, Linear (width)	Linear Foot
Preformed Pavement Marking, Symbols/Legends	Each

SPECIFICATION TE-013-2010
SPECIFICATION FOR PAVEMENT MARKING TAPE
TRAFFIC ENGINEERING DIVISION

3M Stamark™ Pavement Marking Tape
Series 270 ES

Description

3M™ Stamark™ Pavement Marking Tape Series 270 ES is a retroreflective patterned polymer pavement marking that can be used as an inlay marking on new asphalt or as an overlay marking on asphalt and concrete pavement surfaces in good condition. Series 270 ES tape offers "Extended Season" applications due to an improved pressure sensitive adhesive (PSA) package on the bottom surface. Series 270 ES does not require 3M™ Stamark™ Surface Preparation Adhesive P-50 prior to application, if applied during the application season as outlined in the 3M Climate Guide for 3M™ Stamark™ Pavement Marking Tapes.

Series A270 ES: Unlinered. Used for long lines, edge lines, channelizing lines, gore markings, stop bars, and crosswalks.

Series L270 ES: Linered. Used to cut symbols and legends.

Series SMS-L270 ES: Linered. Precut symbols and legends.

Properties

A. Product Features

- Durable, conformable to pavement and retroreflective
- Embedded net provides increased tear resistance
- Pressure sensitive adhesive (PSA) on bottom surface
- No surface preparation adhesive required when applied within standard tape application season as defined by the 3M Climate Guide
- Can be applied early and late season, down to 40°F (4°C)with use of 3M™ Stamark™ Surface Preparation Adhesive P-50
- Retroreflective layer of glass beads bonded in a highly durable polyurethane topcoat
- Manufactured without the use of heavy metals, lead chromate pigments or other similar, lead containing chemicals
- Nominal thickness of 0.065 in. (1.6 mm) at pattern heights
- White: 270 ES
- Yellow: 271 ES

B. Reflectance

Series 270 ES tape has the following initial average retroreflectance values when measured in accordance with ASTM-D4061. The photometric quality to be measured is coefficient of retroreflected luminance (RL) and shall be expressed as:
English RL: millicandelas per square foot per footcandle [(mcd • ft^{-2}) • fc^{-1}] or equivalently as:
Metric RL: millicandelas per square meter per lux [(mcd • m^{-2}) • lx^{-1}]

	White	Yellow
Entrance Angle	88.76°	88.76°
Observation Angle	1.05°	1.05°
Retroreflected Luminance* R_L [(mcd • ft^{-2}) • fc^{-1}]	300	250

*The quantity of retroreflected luminance (R_L) "relates to the way the effective retroreflective surface is focused on the retina of the human eye and to the visual effect thereby produced. It is recommended for describing the performance of highway signs and striping, or large vehicular markings which are commonly viewed as discernible surface areas." Federal Test Method Standard 370, 3.1.2, Note 6, March 1, 1977. Replaces PB 270 ES dated October 2006

C. Color
The preformed markings consist of white or yellow films with pigments selected and blended to conform to standard highway colors.

D. Skid Resistance
The patterned surface of the retroreflective pliant polymer shall provide an initial average skid resistance value of 45 BPN when tested according to ASTM E 303 except values will be taken in one direction and at 45° angle from that direction. These two values will then be averaged to find the skid resistance of the patterned surface.

E. Application
All applications should be installed using the instructions in the appropriate section of 3M Information Folder 270 ES. **Note:** In high-shear transverse markings applications (e.g. right turn lanes and heavy truck traffic) the use of 3M™ Stamark™ Surface Preparation Adhesive P-50 is recommended to enhance adhesive performance of the tape to the road surface. Surface preparation adhesive is not needed when applying the tape during the application season outlined in the 3M Climate Guide for 3M™ Stamark™ Pavement Marking Tapes. The tape can be applied down to 40°F (4°C) ambient temperature outside the dates outlined in the Climate Guide for Stamark pavement marking tapes with the use of 3M™ Stamark™ Surface Preparation Adhesive P-50. For long line applications, the P-50 surface preparation adhesive should be applied with a 3M™ Adhesive Spray Applicator PS-14. For transverse markings, the surface preparation adhesive should be applied using a solvent resistant 3/8 inch nap paint roller.

F. Patchability
Heavy traffic and snow plowing may cause wear and damage. New materials can be installed in these areas with minimal surface preparation by following the manufacturer's recommendations. Remove the damaged material and replace the damaged area by following the instructions in "Overlay Applications" of 3M Information Folder 270 ES.

General Performance Considerations
Stamark pavement marking tapes are highly effective traffic control devices when properly applied according to 3M recommendations provided in product bulletins and information folders. The durability of Series 270 ES tape will depend on traffic conditions, snow removal practices, application techniques used, and pavement and atmospheric conditions at the time of application. Damage will be caused by heavy trucks, excessive encroachment (crossover) on high ADT roadways, narrow lane width, unpaved shoulders, snow removal, and ice control techniques. It is recommended that the customer thoroughly evaluate Stamark tapes under the conditions in the

specified location before making large-scale applications. While experience has shown that, properly applied, these materials are highly effective traffic control devices; 3M makes no generalized performance claims.

Storage

Store in a cool, dry area indoors. Use within one year of receipt.

Health and Safety Information

Read all health hazard, precautionary and first aid statements found in the Material Safety Data Sheet (MSDS) and/or product label of chemicals prior to handling or use. Also refer to the MSDS for information about the volatile organic compound (VOC) content of chemical products. Consult local regulations and authorities for possible restrictions on product VOC content and/or VOC emissions. Electronically, visit us at www.3M.com/us and select MSDS search.

SPECIFICATION NO. TE-012-2010
SPECIFICATIONS FOR HIGH PERFORMANCE TAPE SERIES 380I-5ES
TRAFFIC ENGINEERING DIVISION

Description

3M™ Stamark™ High Performance Tape Series 380I-5ES can be used as an overlay marking on asphalt and concrete pavement surfaces in good condition.
Series 380I-5ES tape offers "Extended Season" applications due to an improved pressure sensitive adhesive (PSA) package on the bottom surface. Series 380I-5ES does not require 3M™ Stamark™ Surface Preparation Adhesive P-50 prior to application, if applied during the application season as outlined in the 3M Climate Guide for 3M™ Stamark™ Pavement Marking Tapes.

A. Product Features

- Durable, conformable, retroreflective preformed tape with non-reflective, matte black contrasting edges
- Embedded net provides increased tear resistance
- Pressure sensitive adhesive (PSA) on bottom surface
- No surface preparation adhesive required when applied within standard tape application season as defined by the 3M Climate Guide.
- Series 380I-5ES tape can be applied early and late season, down to 40°F with use of 3M™ Stamark™ Surface Preparation Adhesive P-50
- Long-term reflectivity design
- Abrasion-resistant microcrystalline ceramic beads bonded in a highly durable polyurethane topcoat
- Yellow microcrystalline ceramic beads incorporated in Series 381I-5ES tape to improve nighttime yellow color
- Manufactured without the use of heavy metals, lead chromate pigments or other similar, lead-containing chemicals
- Patterned design presents a near vertical surface to traffic to maximize retroreflectance
- Nominal thickness of 0.065 in. (1.6 mm) at pattern heights
- White: 380I-5ES
- Yellow: 381I-5ES

B. Reflectance

The white and yellow portion of the markings have the following initial expected retroreflectance values as measured in accordance with the testing procedures of ASTM D4061. The photometric quantity to be measured shall be coefficient of retroreflected luminance (R_L) and shall be expressed as:
English R_L: millicandelas per square foot per foot-candle [(mcd • ft^{-2}) • fc^{-1}] or equivalently as:
Metric R_L: millicandelas per square meter per lux [(mcd • m^{-2}) • lx^{-1}].

	White	Yellow
Entrance Angle	88.76°	88.76°
Observation Angle	1.05°	1.05°
Retroreflected Luminance* R_L [(mcd • ft^{-2}) • fc^{-1}]	500	300

*The quantity of retroreflected luminance (R_L) "relates to the way the effective retroreflective surface is focused on the retina of the human eye and to the visual effect thereby produced. It is recommended for describing the performance of highway signs and striping, or large vehicular markings which are commonly viewed as discernible surface areas." Federal Test Method Standard 370, 3.1.2, Note 6, March 1, 1977.

C. Color
The preformed markings consist of white or yellow films with pigments selected and blended to conform to standard highway colors and a black preformed pattern film border

D. Skid Resistance
The patterned surface of the retroreflective pliant polymer provides an initial average skid resistance value of 45 BPN when tested according to ASTM E 303 except values will be taken in one direction and at 45° angle from that direction. These two values are then averaged to find the skid resistance of the patterned surface.

E. Application
All applications should be installed using the instructions in the appropriate section of 3M Information Folder 380I ES. Adhesive is not needed when applying the tape during the application season outlined in the 3M Climate Guide for 3M™ Stamark™ Pavement Marking Tapes. The tape can be applied down to 40°F ambient temperature outside the dates outlined in the Climate Guide for Stamark pavement marking tapes with the use of 3M™ Stamark™ Surface Preparation Adhesive P-50. For long line applications, the primer should be applied with a 3M™ Adhesive Spray Applicator PS-14.

F. Patchability
Heavy traffic and snow plowing may cause wear and damage. New materials can be installed in these areas with proper surface preparation by following the manufacturer's recommendations. Remove the damaged material and replace the damaged area by following the instructions in "Overlay Applications" of 3M Information Folder 380IES.

Storage
Store in a cool, dry area indoors. Use within one year of receipt.

Health and Safety Information
Read all health hazard, precautionary and first aid statements found in the Material Safety Data Sheet (MSDS) and/or product label of chemicals prior to handling or use. Also refer to the MSDS for information about the volatile organic compound (VOC) content of

chemical products. Consult local regulations and authorities for possible restrictions on product VOC content and/or VOC emissions. Electronically, visit us at www.3M.com/us and select MSDS search

General Performance Considerations

Stamark pavement marking tapes are weather resistant and provide excellent reflectivity and color retention. Experience has shown that these materials are highly effective traffic control devices and will show no appreciable fading, lifting, shrinkage, or chipping when applied according to 3M's recommendations contained in product literature. The durability of Stamark pavement markings will depend on traffic conditions, snow removal practices, application techniques used, and pavement and atmospheric conditions at the time of application. It is recommended that the customer thoroughly evaluate Stamark tapes under the conditions in the specified location before making large-scale applications.

Warranty

3M warrants that 3M™ Stamark™ High Performance Contrast Marking Tape Series 380I-5ES sold by 3M for pavement marking applications in the United States and Canada will remain effective for its intended use under normal traffic conditions and meet the minimum retained coefficient of retroreflection value of 100 millicandelas per foot squared per foot-candle (measured at 1.05° observation and 88.76° entrance angles) subject to the following provisions:

Table 1

Application*	Warranty Period
Longitudinal markings	4 years
*Applications in mountainous, heavy snowfall areas above 5,000 ft. (1500m) are not covered by this warranty.	

If Series 380I-5ES tape is applied in accordance with all 3M application procedures provided in 3M's product bulletins, information folders and technical memos; and fails to retain the minimum reflectance value, fails to adhere to the roadway or fails due to complete wear-through during the warranty period shown above (from the date of installation), 3M's sole responsibility and purchaser's and user's exclusive remedy shall be: 3M will provide the replacement materials that will restore the pavement marking retroreflectivity values to warranty levels or greater.

Conditions

Such failure must be solely the result of design or manufacturing defects in the Stamark high performance tape and not of outside causes such as improper installation or substrate failure. Failure to follow recommended application procedures will void this warranty. Damage to pavement markings caused by snow removal equipment is not covered under this warranty.

A visual night inspection must be made with a 3M representative and a customer representative present to identify areas of the installation which appear to be below the

minimum retained reflectance values as specified in the Warranty Section. Areas which appear to be below the minimum retained reflectance value shall be identified as "zones of measurement." To qualify for material replacement, a "zone" must be at least 360 feet in road length and consist of either edge lines, center lines or lane lines, but not in combination, or a single word or symbol marking.
3M reserves the right to determine the type of replacement pavement marking and method of installation.
Replacement markings will carry the unexpired warranty of the marking it replaces. Claims made under this warranty will be honored only if the customer has maintained an accurate record of the dates of material installation, which constitutes the start of the warranty period. Claims under this warranty will be honored only if 3M is notified of a failure within a reasonable time, reasonable information requested by 3M is provided, and 3M is permitted to verify the cause of the failure.

Limitation of Liability
3M's liability under this warranty is limited to replacement as stated herein, and 3M assumes no liability for any incidental or consequential damages, such as lost profits, business, or revenues in any way related to the product regardless of the legal theory on which the claim is based. THIS WARRANTY IS MADE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND ANY IMPLIED WARRANTY ARISING OUT OF A COURSE OF DEALING OR OF PERFORMANCE, CUSTOM OR USAGE OF TRADE.

Reflectance Measurement Procedures for Warranty

Step 1: A visual night inspection must be made with a 3M representative and a customer representative present to identify areas of installation which appear to be below the specified minimum retained reflectance values in Table 1 on page 2.
Areas which appear to be below the minimum retained reflectance value shall be identified as zones of measurement. To qualify for materials replacement, a zone must be at least 360 feet (108 meters) in road length and shall consist of either edge lines, center lines or lane lines, but not in combination.
Step 2: Within each zone, reflectance measurements must be taken at specified checkpoint areas.
a. Zones Measuring 360 Feet (108 m) to 1,080 Feet (324 m) in Length
No separate checkpoints are required. For continuous lines, reflectance measurements must be made at approximately 20 ft. (6 m) intervals throughout the zone. For skip lines, two measurements must be taken at two random locations on each skip.

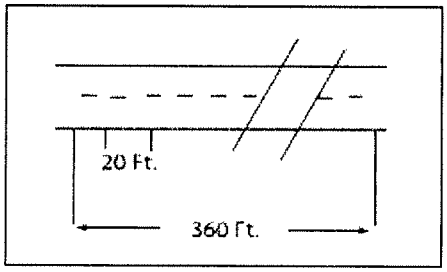


Figure 1: Measure every 20 ft. (6m) on continuous lines or (2) measurements per skip for each checkpoint.

b. Zones Measuring 1,080 Feet (324 m) to 6 Miles (9.6 km) in Road Length

A total of 18 measurements must be made at each of three checkpoints within the zone, including the start point, the mid point, and the end point. For continuous lines, reflectance measurements must be made at 20-foot (6 m) intervals throughout each checkpoint. For skip lines, two measurements must be taken at two random locations on each skip.

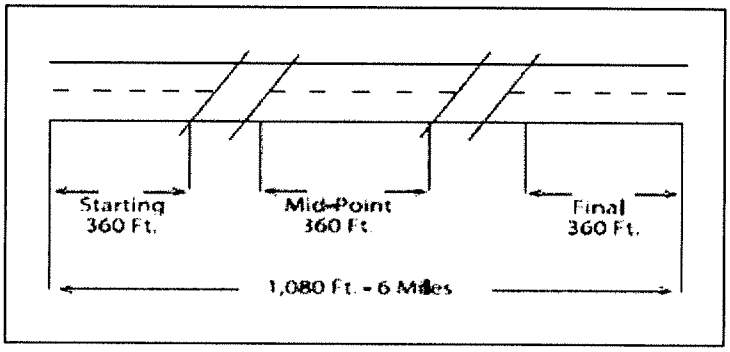


Figure 2: Measure every 20 ft. (6m) on continuous lines or (2) measurements per skip for each checkpoint.

c. Zone Greater than 6 Miles in Road Length

A total of 18 measurements must be made in each checkpoint within the zone, including the start point, the end point and at approximately 3-mile (4.8 kilometers) intervals throughout the zone. For measurement intervals on continuous lines, center lines, or lane line skips, refer to Section b above.

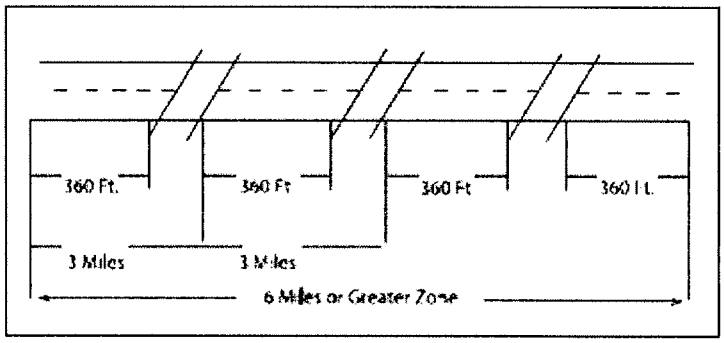


Figure 3: Measure every 20 ft. (6m) on continuous lines or (2) measurements per skip for each checkpoint

Step 3: All reflectance measurements made at the checkpoints shall be made on a clean, dry surface at a minimum temperature of 40° F (4° C). The test instrument shall use an Entrance Angle of 88.76° and an observation angle of 1.05° which represent a simulated driver viewing geometry at 30-meter distance.

Step 4: All reflectance measurements within the zone must be averaged to determine if the minimum retained reflectance values have been met.

Materials Replacement Condition

Markings must be applied according to the instructions in 3M Information Folder 380IES to qualify for any applicable materials replacement provisions.